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Victory Loan—They finished their job—Let's finish ours!

Contractors and Engineers Monthly

Vol. 42, No. 12

DECEMBER, 1945

\$3 a Year, 25 Cents a Copy

Covering the Field

Road Grading and Paving

For the reconstruction of 16 miles of a major route, much of it relocation, two contracts were awarded. For the concrete paving, the two contractors pooled their forces to organize one crack crew to pave the total length (page 1).

Rebuilding Damaged Levee

Rebuilding an old flood-damaged levee called for moving 900,000 cubic yards with both tractor-scrapers and self-powered rubber-tired units. See page 1.

Battling Snow and Ice

In a midwestern state, wet snow constitutes the major winter problem of the highway department (page 1). County snow removal with both county-owned and hired units, at a cost of \$130 a mile, is described on page 36.

Driving and Lining Tunnels

A large irrigation project in Oregon and the methods of driving two 11-foot tunnels, 3,360 and 3,440 feet long, through rock and placing the concrete lining for these tunnels are described on page 2.

County Road Work

Varied road-maintenance methods and some cost data on county work in the Pacific Northwest are discussed on page 6. See also pages 17 and 29.

Asphalt Resurfacing

Specially designed tools for constructing the widening trench featured a contract for 6.36 miles of resurfacing. See page 9. The hot-mix plant producing the surfacing for 8.8 miles of 24-foot pavement is described on page 26, while the use of cold plant-mix spread by a motor grader corrected inequalities and improved a road surface (page 75).

Two Types of Bridge Jobs

To meet the problem of placing concrete in bridge footings at various levels, the contractor for a concrete overpass devised a novel chute for use with the paver (page 15). A quite different problem, that of maintaining traffic over a wood bridge while repairs were going on, is described on page 71.

Huge Airport Grading Job

One of the largest grading jobs in the country is under way at Charleston, W. Va., where 9,000,000 cubic yards of dirt and rock are being moved in the construction of Kanawha Airport. For methods and equipment, see page 19.

Dredging in Harbor

The dredge DeWitt Clinton and its work in the Savannah River to maintain the channel to the port of Savannah are described on page 33.

Paving on Iwo Jima

An account of the Seabees' quarry and crushing plant, operated under fire to furnish aggregate, and the penetration-macadam paving of fighter-plane runways appears on page 39; the story is told in pictures on pages 48 and 49.

You will find "In This Issue" on page 4

Grading, Paving 16-Mile Highway

Two Contracts Awarded For Reconstruction of Route; One Concreting Outfit for Both Jobs

IMPORTANT U. S. 80 and U. S. 11 is being reconstructed for a 16-mile stretch in west-central Alabama from the Mississippi state line eastward to the town of Livingston under two large grading and concrete-paving contracts which, together with two additional bridge contracts, to be described in a subsequent article, amount to over \$1,000,000. To speed construction, the Alabama State Highway Department divided the road work into two contracts, the western section of 7.4 miles going to Cobb Brothers Construction Co. of Meridian, Miss., of which M. G. Cobb is President, on its bid of \$408,397, and the eastern section of 8.5 miles awarded to E. J. & W. L. Cobb, Inc., contracting firm of Montgomery, Ala., for \$520,080.

The existing road was an 18-foot light-penetration-type bituminous surface varying in thickness from 2 to 6 inches, depending on the number of plant-mix and seal-coat resurfacings applied to sections of it during its 18-year life. Its surface was rough and irregular, and the soil base beneath was of poor material, mostly clay which was generally heavy with moisture from springs and ground seepage.

Permission for the reconstruction, classified as a strategic-network project, was granted by the War Production Board because of the great amount of wartime freight trucked over the road, together with the heavy 48-a-day bus schedules maintained on this main

(Continued on page 66)



C. & E. M. Photo

Among the dirt-moving equipment on Kraus' levee contract was a Lima dragline with a 3½-yard Hendrix bucket which loaded to bottom-dump Euclides.

Wet Snow Presents Problem in Removal

Eighteen Northern Indiana Counties Affected in 1945; Prompt Action by Patrol Crews Kept Roads Cleared

ALTHOUGH snow storms of any size in Indiana are usually confined to the northern tier of about eighteen counties, the fall in this "snow belt" is generally wet and heavy, making its removal the major winter problem of the Indiana State Highway Commission. The most heavily traveled roads in the state pass through these subject-to-snow counties which lie north of a line drawn from east to west across the state just below Fort Wayne. Engineers of the Maintenance Division have always had their greatest trouble with snow in the 30-mile zone bordering Lake Michigan.

(Continued on page 87)

NEEDLE BEAMS KEEP BRIDGE IN USE DURING REPAIR



C. & E. M. Photo

J. F. Thomson, contractor, used two needle beams to carry the load during repair to the wood-pile bent substructure of two wood bridges in Georgia. Here a Simplex jack lowers a beam, to put the load back on the repaired bent and cap. See page 71.

Old Levee Rebuilt After Two Breaks

A 3-Mile Contract Let to Protect Large Freight Yard South of East St. Louis; 900,000 Yards Moved

A 3-mile stretch of levee on the east bank of the Mississippi River which received a battering in both the 1943 and 1944 floods has been repaired under a contract calling for the placement of 900,000 cubic yards in the damaged sections. Located about 10 miles below East St. Louis, Ill., the levee stands between the river and the busy Dupo freight yards of the Missouri Pacific Railroad. The contract, under the direction of the U. S. Engineer Department, St. Louis District, was awarded to Samuel Kraus, St. Louis contractor, in September, 1944, and was completed during the past summer. A variety of earth-hauling equipment was used on the job, including both tractors and scrapers and bottom-dump self-powered rubber-tired trucks loaded by draglines.

The construction lies in the two counties of St. Clair and Monroe, in the Wilson and Wenkel and Prairie Du Pont Drainage and Levee District. The original levee was built after the 1903 flood to a height protecting the area up to about 34.0 feet above zero on the St. Louis gage, which is about 4 feet above flood stage. The 1943 flood in the Mississippi River valley topped the levee, cutting it up pretty badly, but it was rebuilt to its original section that same year. This did not prove to be enough, however, for another flood struck with great fury in the spring of 1944, topping the levee again, and breaking through in one location with a deep crevasse. Such record floods in two successive years were unprecedented and caused considerable damage to the Dupo freight yards, which handle about 8,000 cars daily, resulting in slow-downs and stoppages to vital war industries in the St. Louis area.

New Levee

In some parts of the 3-mile improvement a new alignment required an entirely new section of levee to be built, and in these areas the old levee was used in the fill, while in other sections the old levee was rebuilt to approved grade and cross section. As a result, the quantities per station had a wide variance from 1,000 to 10,000 yards. On the north the levee ties in to a levee section which had been reconstructed to approved strength in 1940-41 and which had successfully resisted the double floods. On the south it connects to a high embankment leading to the new toll bridge which crosses the Mississippi to Jefferson Barracks in Missouri.

(Continued on page 13)

Concrete-Lined Tunnels For Big Irrigation Project

Deschutes Job Includes An Earth Dam, Tunnels, Canal, Flume, Siphon To Serve 100,000 Acres

THE Deschutes Project of the U. S. Bureau of Reclamation in central Oregon is designed to supply a full quota of irrigation water to an area of 50,000 acres of dry land in the vicinity of Madras. The present productivity of this fertile land lying just east of the Cascade Range is seriously impaired by the lack of rainfall which amounts to only 8 inches annually, but despite this handicap it has produced excellent wheat crops in the past. An additional 50,000 acres near Bend and Redmond, now under irrigation, are furnished supplemental water by the reconstruction of Crane Prairie Dam.

The Deschutes Project, estimated to cost \$8,400,000 at pre-war prices, is now being built by several contractors. The operations on some of the more interesting features of this work will be described in detail in articles appearing in this and future issues.

Construction Features

The general design of the Deschutes Project includes an earth and rock dam forming the Wickiup Reservoir on the Deschutes River 43 miles south of Bend, Oreg. This reservoir will impound 180,000 acre-feet of water to be used to regulate the flow in the river. Water released from the reservoir will follow the channel of the river to a point at the north city limits of Bend where a diversion dam was constructed several years ago by a private irrigation corporation. At this point, the Bureau of Reclamation has constructed outlet works and, from them, an unlined canal designed to carry a flow of 1,000 second-feet for a distance of 65 miles in a northerly direction. The construction of this canal, winding as it does through the eastern foothills of the Cascade Range, required much heavy excavation, a great deal of which was in rock cuts. Where the canal crosses the canyon of the Crooked River at an elevation approximately 150 feet above the surface of the water in the river, it was necessary to build a very unusual concrete flume designed to carry not only the 1,000-second-foot flow of water across the canyon but to also provide a bridge capable of sustaining the weight of a 30-ton crane which will be used in the operation and maintenance of the irrigation project.

There are also included two horseshoe-shaped tunnels, 11 feet 3 inches

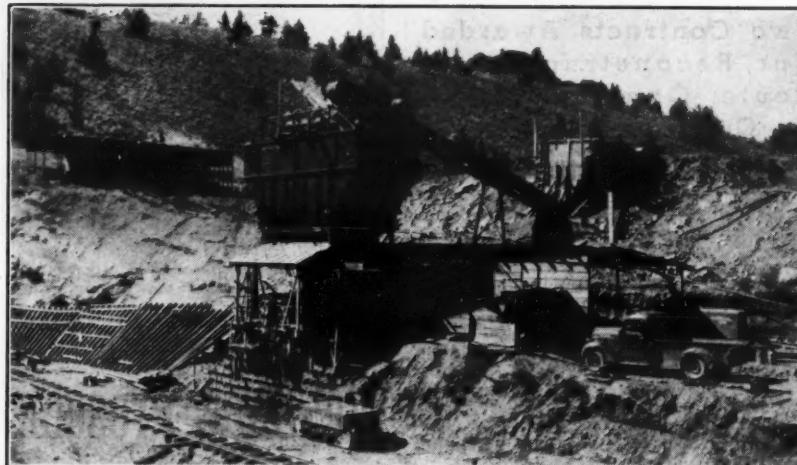
By FRANK B. SARLES,
Western Field Editor

inside diameter, through two tuff ridges lying north of Bend. The two tunnels, one of which is 3,360 feet in length and the other 3,440 feet long, were built under unit-price contracts. It will also be necessary to construct a high-pressure siphon where the canal crosses Willow Creek near the northern end of its length.

To offset the reduction in the power output at a privately owned plant on the Deschutes River at Bend, which will result from the storage of water in the Wickiup Reservoir during the non-irrigation season, the Bureau of Reclamation will install an additional 1,500-kilowatt generator at the Cove plant of

Methods of Driving and Lining 11-Foot Tunnels, 3,360 and 3,440 Feet Long, Through Rock

AN important feature of the Deschutes Irrigation Project in central Oregon was the construction of two concrete-lined tunnels 3,360 and 3,440 feet long to carry the 1,000-second-foot flow of the main canal through volcanic tuff ridges. The contracts for these tunnels were awarded to Wixson & Crowe, Redding, Calif., by the U. S. Bureau of Reclamation in the spring of 1944. Both tunnels are horseshoe-shaped, with the greatest inside dimension 11 feet 3 inches, and are lined with plain concrete of 10-inch nominal thickness.



C. & E. M. Photo
Wixson & Crowe, contractor for two concrete-lined tunnels, totaling 6,800 feet, on the Deschutes Irrigation Project set up its central mixing plant at the north portal of the south tunnel. At the upper left is the generator and compressor house.

the Pacific Power & Light Co. on the Crooked River and will build and reconstruct certain connecting transmission lines and substations.

Personnel

All work on the Deschutes Irrigation Project, both that constructed by the Bureau of Reclamation using Civilian Conservation Corps and Conscientious Objector Camp labor, and that awarded under unit-price contracts, is under the direction of C. H. Spencer, Construction Engineer of the Bend, Oreg., office of the Bureau of Reclamation, for which Frank A. Banks is Regional Director and Walker R. Young is Chief Engineer.

No cause is hopeless if it is just. Errors, no matter how popular, carry the seeds of their own destruction.

Setting Up the Job

The two tunnels are about a mile apart and construction was conducted in both tunnels simultaneously, although not all operations were identical at the same time. By starting the tunneling operations with a truck-mounted plant, first in the north end of the south tunnel and then in the south end of the north tunnel, the contractor was able to have the work well under way before the assembly and erection of the track-mounted plant was completed. After 625 feet of the bore had been made in each of these locations by the first plant, the track-mounted equipment was put in service and the portable equipment sent to the north end of the north tunnel where it completed 635 feet of bore and then to the south end of the south tunnel where it completed 900 feet of work before holing through.

The initial outfit consisted of a jumbo mounted on a Dodge truck, and a Caterpillar D7 tractor equipped with both a bulldozer and a cowdozer which did the mucking. The jumbo was a welded framework of 4-inch pipe cross-braced by 3-inch steel channels. It was 12 feet long and rested on the flat bed of the truck, its 3-foot height permitting four Ingersoll-Rand drifters mounted on swiveling arms to reach to the highest and lowest holes. A wood deck with side wings which could be raised to a horizontal position and supported by telescoping pipes from the jumbo frame provided a 5 x 18-foot working deck for the drillers about 7 feet above the bottom of the bore. The other jumbo was of similar construction but mounted on a mine car and was moved to and from the tunnel heading by a General Electric storage-battery locomotive. It also provided swivel arms for four Gardner-Denver drifters used with it and had six $\frac{3}{4}$ -inch air connections at each level. A working deck was provided at the



C. & E. M. Photo
The concrete lining in the two tunnels on the Wixson & Crowe contract on the Deschutes Irrigation Project was placed by a Rex 160 Pumpcrete served by Rex Moto-Mixers, all mounted on mine-car trucks. Here is the outfit on the tracks outside the tunnel.

approximate mid-height of the bore.

Air was supplied to the tunnel headings through a 4-inch line from two 500 cfm Gardner-Denver stationary compressors in sheds erected near the contiguous ends of the two tunnels. Air from these compressors went to 20-foot-long x 4-foot-diameter receiver tanks set at each portal, and from them through a 4-inch line which was extended to within 50 feet of the heading as tunneling progressed. From the end of this line, a 2½-inch air hose was connected to the jumbo.

In the same house with the compressors a 100-kw generator powered by a Murphy diesel engine provided current for the tunneling operations through a three-wire 440-volt line of No. 8 rubber-covered conductor taped to wooden pegs driven in holes drilled in the tunnel walls 2 feet above the spring line. The Conway mucking machine took current from this line which also supplied the tunnel lights, 50-watt globe spaced at 40-foot intervals and 100-watt globes near the heading. Beside the larger generator was a 75-kw unit driven by a Caterpillar diesel engine serving the battery charger for the locomotive, the water pump, and miscellaneous outside lights.

Water for the job was pumped 1,800 feet from the Crooked River by a two-stage Ingersoll-Rand centrifugal pump with a 3-inch suction and a 2-inch discharge and powered by a 50-hp electric motor. The pump was set about 10 feet above the water with a float-supported hose suction. Just off the discharge end a 1½-inch riser was provided for priming the pump. Beyond this was a check valve and a gate valve and then a 1-inch hose connection with a piece of hose long enough to reach back to the priming riser. Since the 3,000-gallon storage tank into which the water was pumped was 700 feet higher, the back pressure in the line made water for priming instantly available through this connection. From the 3,000-gallon storage, set 120 feet above the tunnels, the water was fed to the headings and the concrete plant by gravity through a 2-inch line.

Ventilation was provided by blowing air into the tunnels, no exhaust fans being used. This air was supplied through a 16-inch blower line from Roots-Connersville fan powered by a Caterpillar D13000 diesel engine or a Western 16-inch fan powered by a 50-hp electric motor, both being used when operations were conducted at two headings.

The industrial track used in most of the tunneling, as well as in the concrete-lining operations, was of 30-pound rails laid to a 30-inch gage on 6 x 6-inch wood ties spaced 3 feet apart. The ties were laid flat while the track was in use for tunneling but when the track was relaid on the completed invert to carry the lining forms and concrete-placing equipment, their bottoms were cut to the radius of the invert.

Because of the serious dust menace on the winding mountain roads in the vicinity of the tunnels, the contractor provided a rather unusual sprinkling device which saw much service. A rectangular steel tank 5 feet high, 2 feet wide, and 6 feet long was mounted crosswise on two wooden skids and tied to them by $\frac{1}{4}$ x $1\frac{1}{2}$ -inch steel straps running from the end of each skid over the top of the tank and down to the opposite end of the same skid. From the bottom of the tank a 1½-inch pipe was extended back and down so as to clear the end of a flat-bed truck when the skid-mounted tank was set on it, the skids parallel to the length of the truck body. To this pipe was attached a piece of 2-inch pipe set at right angles to provide an 8-foot spray through a slot cut in the under side of the cross pipe. Hand-operated valves shifted the flow of water to either the sprinkling bar or

(Continued on page 78)

The pavement will be Asphalt
specified the State Engineers



The asphalt will be Texaco
decided the Contractor

That combination of decisions resulted in the construction of a 3-inch plant-mixed Texaco Asphalt pavement on this State Highway in southern Illinois.

The same combination of decisions has been made on one highway project after another these past 40 years, with the result that thousands of miles of America's highways have been Texaco-paved.

Texaco Asphaltic products are indeed "old stand-bys" of U. S. road

Constructing three inches of dense-graded Texaco Asphaltic Concrete paving on State Highway No. 145 in Massac and Johnson Counties, Ill. The Charles G. Gilmore Asphalt Products Company of Anna, Ill., was the contractor.

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TEXACO ASPHALT



Contractors and Engineers Monthly

THE NATIONAL BUSINESS PAPER FOR CIVIL ENGINEERING CONTRACTORS AND HIGHWAY ENGINEERS AND COMMISSIONERS

Member of Controlled Circulation Audit

Issued Monthly by Buttenheim-Dix Publishing Corp.

Editorial and Business Office: 470 Fourth Ave., New York 16, N. Y.

Acceptance under the Act of June 5, 1934, at Mount Morris, Illinois, authorized March 26, 1945.

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* On leave of absence for military duty.

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Routing Expressways

An increasing number of reports are coming in, now that more and more highway plans are reaching the public gaze, that John Q. Public is raising a rumpus over the location of many of the new expressways. John Q. cannot get over the idea that every expressway in his county must come sailing through his main street, whether or not there is sufficient width available to care for current local traffic and all the future traffic created by an increase in post-war motor vehicles and the invariable growth of traffic caused by providing a new facility.

The other primary objection to location is that it will take certain properties off the tax rolls by making them public lands. The mayor of an eastern city claimed that the location of a new expressway, as proposed by state highway officials, would cause a reduction of nearly \$300,000 in the assessment rolls. It is true that any taking of private lands for the use of the public does hit local assessment rolls in some degree at once. Officials who plan such projects are morally bound to select the location that will provide the traffic facility most economical to construct and operate for the public good, with the minimum damage to local property and assessments.

This is sometimes an impossible task,

but what the local officials and property owners fail to take into consideration is that when the expressway is completed, relieving local streets and roads of traffic that has choked them for local services and business, new property values are created through the elimination of congestion and the construction of new, and usually better, homes and business structures as a result. Thus in the long run the tax rolls increase and the tax rate goes down, benefiting the community.

An expressway loses its service value to traffic if it zigzags to, and through, or at least close to, every municipality. Its very name implies speed and easy movement of traffic. Its location must be the mean of all routes that would serve all communities, tempered by the physical condition of the terrain it crosses and the direction in which traffic would travel as shown by careful traffic surveys.

One state is having a terrific battle because officials would swing the location of a major post-war highway through the state capital which "specializes in politics" and little else. Just as alcohol and gasoline do not form a mixture conducive to traffic safety, politics and highway location do not make good partners in creating economical highway transportation.

Post-War Tunnels

We hear much about a \$3,000,000,000 highway construction program, the creation of 3,000 new airports, the remarkable program of expanding irrigation under the guiding hand of the Bureau of Reclamation, and the new flood-control plans of the U. S. Engineer Department. These are admirable, and we hope that sufficient contract plans are ready for letting, so that a major portion of the employment slack will be absorbed by needed public and private construction.

In the one specialized field of tunnels, there is a vast potential construction volume right in this country, to say nothing of the real possibility that the perennial proposals to tunnel under the English channel, a project which will lean heavily on American engineering design and construction technique for its prosecution, may bear fruit. We have mentioned the Bureau of Reclamation irrigation projects, but it is not generally known that its post-war program contemplates driving several hundred miles of tunnels.

Alameda County, Calif., plans to duplicate the Posey Tube beneath the estuary between Alameda and Oakland to relieve the congestion of the present tube in the most economical manner. The tunnel from the Battery in New York to Brooklyn will be completed, as will the far greater project connecting

Staten Island, land of fog-bound ferries, with Manhattan. Another New York City project is being demanded by that vast hoard of motorists and truckers whose terminals are New Jersey and Long Island and to whom the crossing of New York City, with its interminable delays caused by unsynchronized cross-town traffic lights means loss of time and tardy deliveries. They urge the prompt completion of a four-lane tunnel driven through solid rock 80 feet below the streets of New York as recommended by the Borough President of Manhattan and the Chairman of the New York City Tunnel Authority, to cost about \$75,000,000. It would link the existing Queens Midtown Tunnel on the east with the Lincoln Tunnel on the west. A feature of this project is a huge underground terminal between Fifth and Sixth Avenues and 36th and 38th Streets, midway between Grand Central Terminal and the Pennsylvania Station to serve passengers from buses, taxis, and chauffeur-driven cars who would reach the surface by elevators.

Then we come back to that subaqueous tunnel that is bound to call to America for personnel—the 20-mile tunnel beneath the English Channel, the approaches of which would extend its tunnel section to about 30 miles. It would be driven from near Cap Griz Nez on the French side to a point near Folkestone in England. This great project was first proposed in 1802 to extend from Calais to Dover. The state of Anglo-French relations has been the barometer of diplomatic and engineering enthusiasm for the project. As late as 1939 the idea of immediate construction was considered by the Allied Supreme War Council as a good investment at £60,000,000, even if it would shorten the war by only two weeks, as the daily war budget was then running close to £6,000,000. In every way the tunnel would be an asset to Britain, and in no way a liability, so the Channel Tunnel may be an early post-war project, along with the even greater mileage of tunnel construction contemplated in our own United States.

ARBA Meeting Will Discuss Many Topics

Arousing public interest in the subject of better highways will be one of the keynotes of the Forty-Third Annual Convention of the American Road Builders' Association at the Stevens Hotel, Chicago, January 14-17, 1946. "We shall endeavor to bring home to the people of this country a realization of the economic stake that every American has in a road," said Charles M. Upham, Engineer-Director.

Another important feature will be the activities of the technical committees group which treats some twenty specific phases of construction. Among the subjects will be stabilization of soils; alignment, grade, and right-of-way; contract system vs. day labor; express highways; grade separations, railway and highways; and visual education.

"Contractors and engineers will find that these technical discussions present ways for saving time and money, and will well repay close attention," declared H. F. Clemmer, General Chairman of the group. "In the field of soil compaction, for example, new methods and new equipment not only have a dollar-and-cents value to the contractor and engineer, but the results obtained are much better and far more lasting." Technical programs are planned for the afternoon of January 15 and both morning and afternoon sessions on January 16.

All divisions of the association will hold business sessions at which problems confronting the industry will be discussed. Stabilization of wages and employment in the construction industry will be high on the agenda of the contractors' meeting, according to Burton F. Miller, Managing Director of the Highway Contractors' Division.

Prominent members of the Public Roads Administration and the Federal Works Agency will address the County Highway Officials' and Municipal Divisions, on the subject of Federal Aid to county and urban projects, announced Major John A. Long, Manager of those divisions. Thursday afternoon, January 17, will be devoted to the organization of the American Institute of Local Highway Administration, he said.

The Airport Division will present papers on airport construction, design, and maintenance by well known figures in the field of aeronautics, declared Walter R. Macatee, Airport Division Manager. "Topics have been assigned and we feel sure that the outstanding speakers, each an authority in his line, will accept," said Mr. Macatee.

Among the regular events of the convention will be the Old Timers' Dinner on Tuesday evening, January 15, and the annual banquet on Wednesday evening, January 16.

Government officials and members of Congress will be present at the meeting to discuss post-war legislation and construction. Among those who have already accepted is Major General Philip B. Fleming, Federal Works Administrator.

Nez on the French side to a point near Folkestone in England. This great project was first proposed in 1802 to extend from Calais to Dover. The state of Anglo-French relations has been the barometer of diplomatic and engineering enthusiasm for the project. As late as 1939 the idea of immediate construction was considered by the Allied Supreme War Council as a good investment at £60,000,000, even if it would shorten the war by only two weeks, as the daily war budget was then running close to £6,000,000. In every way the tunnel would be an asset to Britain, and in no way a liability, so the Channel Tunnel may be an early post-war project, along with the even greater mileage of tunnel construction contemplated in our own United States.

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Prequalification Data For State Contracts

Many contractors will be studying the activity of construction outside their own states with especial interest in the coming months to determine whether to expand sufficiently to bid on work outside their accustomed territory. As an aid in planning such expansion, each organization should have a copy of the "Summary of State Prequalification and License Requirements for General Contractors" prepared by the Bureau of Contract Information, Inc., 1420 New York Ave., N. W., Washington 5, D. C.

The summary was published to fill a real need, as the Bureau has received many requests for information dealing with individual states. Issued early in 1945, it is to be revised biennially to cover changes which may occur in years when the state legislatures meet. Under each state is a concise clearly worded statement covering whether or not prequalification and/or a license is required, the proper steps needed to qualify for bidding, and the cost. Single copies of these summaries may be secured free by contractors writing to the Bureau of Contract Information on their business letterhead.

The Bureau of Contract Information was established in 1929 through the joint efforts of contractors and surety companies to raise the standards of responsibility in contract construction. It accumulates and verifies information regarding contractors; prepares condensed factual reports; and supplies these reports, on request, to awarding officials and others having a direct and legitimate interest in the construction capacity and business reputation of contractors. Through this, it serves contractors by making information regarding them quickly available to awarding officials, and it serves officials by supplying information to guide or support their judgement in awarding contracts. The Bureau's great benefit to contractors, however, is that it helps to establish their responsibility clearly to prospective owners, by weeding out from contract bidders, who might be considered for awards, the ones who are not responsible and are clearly not entitled to a contractor's surety bond.

Atom Bomb and Lumber

Shortages of construction lumber during the past few years can now be readily appreciated with the revelation by the Government that 360,000,000 board-feet went into the construction of Oak Ridge, Tenn., and Richland Wash., the two communities built for the development of the atomic bomb. Virtually every type of construction lumber and some hardwoods were included in the total, with southern pine being used extensively in Tennessee and western woods in the Washington project. Housing alone necessitated the use of 35,000,000 square feet of plywood. About 20 per cent of the lumber was procured in the open market, the balance being obtained through the auction system.

MIXING
IN
35°
WEATHER

HIGHWAY COMMISSIONER STATES

SEAMAN MIXER

ADDS

30 DAYS TO 1945 ROAD CONSTRUCTION SEASON



In northern Wisconsin Counties the road construction season at best is so short that peak efficiency and high-pressure effort must be maintained to meet each year's essential road building and maintenance demands. A Highway Commissioner (name and county on request) in Northern Wisconsin reports that in the season just completed his crews, using the SEAMAN MIXER, were able to mix oil

and aggregate successfully and with excellent control of voids, in weather as cold as 35° F. They used pit-run aggregate,—approximately half sand and half gravel in laying an oil mat 24 feet wide and 2 inches deep. In spite of the temperature,—production averaged a half mile a day. In the final ten days of construction, the thermometer seldom rose above 40°. "We would have had to shut down 30 days ago if it weren't for our SEAMAN MIXER", was the Commissioner's summary of the work. Just another reason why the SEAMAN MIXER has become invaluable in the road construction field.

C-114

Convenient, — Practical, — Educational! Packed with information for anyone interested in soil stabilization. "Soil Stabilization Methods" compiled by Seaman Engineers is yours on request. Just write and ask for Bulletin E-24.



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County Road Maintenance; Some Hints on Handling It

The 175 Counties in the Pacific Northwest Solve Problems in Variety of Ways; Some Cost Data

By J. F. CAMERON, Maintenance Engineer, Division 8, Public Roads Administration

* THE Pacific Northwest faces the return of peace with many problems due to an increased population, but with confidence that its abundant resources will provide the post-war opportunities that all have hoped for. In this region, including the states of Washington, Oregon, Idaho, and Montana, cities and towns have been abnormally crowded. Although they will lose some of this wartime congestion, rural areas are certain to experience a steady growth. The necessity of feeding larger urban communities, together with the agricultural opportunities to be created by development of many new irrigation projects, will result in a larger rural population with increased problems for local government. An important one will be the rehabilitation and maintenance of county roads.

county roads.

Deferred farm expenditure, enlarged rural purchasing power, and establishment of new farms—4,000 in Oregon alone since 1940—will result in the transportation of large quantities of farm machinery, fencing, livestock, and other necessities. Deferred maintenance and the need for reconstruction have accumulated, and call for the most efficient expenditure of available road funds.

The great divergence of soil, topographic, and climatic conditions over this region produces a wide difference in road maintenance problems, methods, and costs. Within some individual subdivisions may be found fertile valleys adjoining arid deserts; elevations range from 1,000 to 5,000 feet and annual precipitation from 20 to 200 inches. Variations in topography of the region are equally diverse. Broad and highly cultivated river valleys, rugged mountains, a rough indented coast line, high desert plateaus, and rolling prairies characterize the terrain.

The prehistoric uplift of great mountain ranges, followed by the encroachment of a thick ice cap, with the erosion resulting from the flow of glaciers and streams, deposited some soils of poor quality for road building in depressions and shallow lakes. However, the activity of these glaciers and streams provided an apparently unlimited supply of

river-washed sand and gravel of fine quality, which is found generally over all four states. It is possible to secure, without difficulty or great expense, ample quantities of suitable pit-run sand and gravel to blanket unfavorable soils and provide adequate inexpensive bases. In southern Idaho and eastern Oregon, volcanic activity provided natural materials which are being used to good advantage.

Maintenance Administration

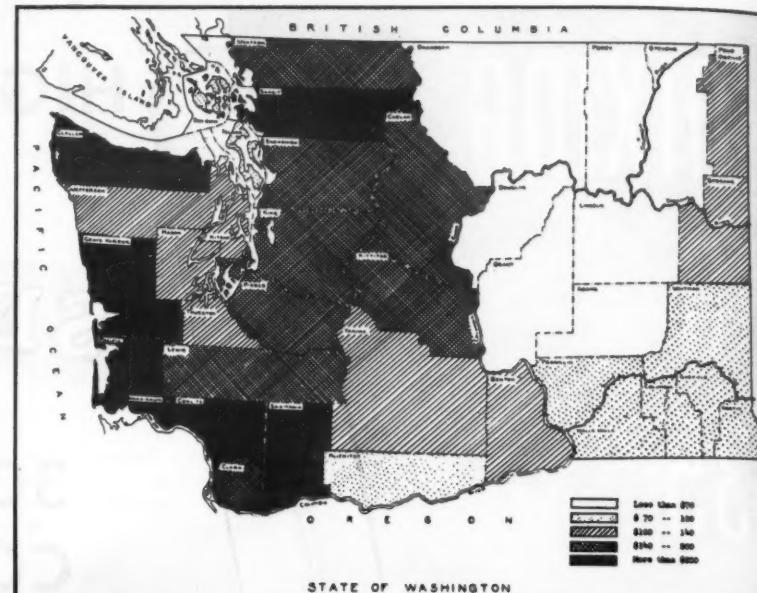
There are, in the four states, 175 counties responsible for the maintenance of 150,000 miles of road. The surface types are given in the accompanying table.

In all four states, county road maintenance is, by law, the responsibility of a Board of County Commissioners. In but one state, Washington, is it required that a qualified licensed engineer be appointed and held responsible for the construction and maintenance of the county road system. In five of the counties of this state there is unified or one-district control under the direction of the engineer. Each of the other thirty-four counties is divided into three com-

Road-Surface Types in 175 Counties in Pacific Northwest

missioners' districts, with maintenance activities generally under the control of the commissioner for the district.

In the other states, employment of an engineer is optional with the commissioners, except under certain conditions in the state of Montana. In that state, counties with a population of 15,000 or more are required to have a qualified engineer responsible for county road activities. Three of the fifty-six counties qualify under this statute and in three or four more this authority is delegated by the commissioners. In Oregon, twenty of the thirty-six counties employ an engineer qualified and responsible for the control and direction of road maintenance. Eleven counties have the one-district system of organization. Idaho, with forty-four counties and ninety-eight highway districts, has two counties in which an engineer is responsible for local road maintenance, and in two others the county engineer



Annual expenditures per mile for maintenance of all types of county roads, except unimproved, in all counties in the state of Washington.

has some responsibility for road surveys and construction. In some Idaho counties most or all of the area is covered by districts and in others only a part is covered. Some of the smaller districts have only a few miles of road, a limited income, and a part-time organization. In such cases equipment is idle a large part of the time and unit costs are high.

In most counties having one-district control, and in some others with maintenance activities largely under the

faced roads and to gravel or stone-wearing courses on surfaced roads blading constitutes the greater part of the counties' maintenance operation. Heavy-duty diesel-powered motor patrols are preferred in this area for this work. Operation of this type of equipment is reported as being smooth and economical.

One county has found economical use for a four-wheel-drive truck with hydraulic underbody blade. This truck is used for blading shoulders, plowing snow, and in the oiling season is equipped with a spreader box for bituminous construction. It has been found that the truck is fast and efficient in blading shoulders, and the variety of uses makes continuous operation possible.

One county in western Washington reports an average total cost of maintaining rock-surfaced roads at \$200 per mile per year; but, when bituminous treated, the average drops to \$60 per mile. To reduce the high cost of main-

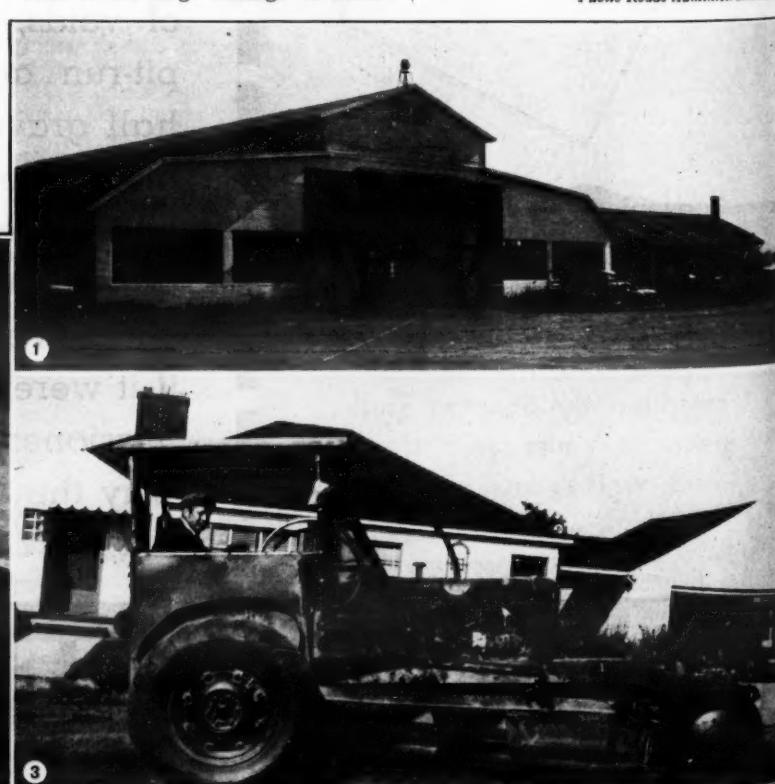
direction of a highway engineer, well developed and reliable cost-accounting systems and equipment-rental plans have been established. When counties have no equipment-rental plan in operation, there is little information available to serve in eliminating the purchase of equipment too expensive for the maintenance work involved, or to aid in disposing of equipment which ceases to earn more than its upkeep and repair.

Equipment and Costs

Due to the large mileage of unsur-

Equipment plays an important part in economical county-road maintenance. 1. Jackson County, Oreg., has a fully equipped repair depot 100 x 100 feet on a 4½-acre tract, to maintain its machines. 2. A number of counties in the Pacific Northwest use Athey Force-Feed Loaders for economic ditch cleaning, loading aggregate and pre-mixed bituminous material, and light grading operations. 3. Clarke County, Wash., uses a light patrol blade for light finishing

and similar road operations. In addition, the administration has





French Press and Information Service Photos
To restore the port of Le Havre, France, residents used every means, primitive and modern, which were at hand. Left, the mass of wreckage to be cleared; above, horse-drawn carts were pressed into service; right, modern tools, when available, were a great help.

Citizens Rebuild Port of Le Havre

To rebuild the French port of Le Havre after almost four years of incessant bombing would require at least 25 years, French and Allied engineers estimated after the liberation of the city last year. But the Havrais, citizens of France's second port, decided they could not wait that long and began removing the rubble of war and rebuilding the city on their own initiative.

Thousands of willing hands, in fact almost every able-bodied person in the city, aided by volunteers from many parts of France began clearing the wreckage of the great docks and warehouses, the cut railways, the caved-in roads, and the demolished buildings. Tools of the most primitive nature, often the hands alone, were impressed into service, along with whatever modern equipment could be spared by the fighting armies in the vicinity.

Order gradually emerged from chaos, and the ubiquitous Nazi pillboxes began to disappear from the landscape. Sunken shipping and submerged mines in the harbor provided a huge task, but with Allied aid it was accomplished sufficiently to permit a trickle of supplies to enter Le Havre once more. Recent shipments to the port have included coal, steel, wheat, and other vital foods for starving Europe. As the war ended, more equipment became available for the Havrais' task, and the city is returning to normal much faster than the engineers thought possible.

Delivery-Delay Reasons

Told to H. O. Penn Party

Reasons behind the long delays in delivering new machinery to contractors, highway departments, and road builders were explained by executives of more than twenty manufacturers at the eighth annual get-together of the H. O. Penn Machinery Co., equipment distributor of New York City. The party, which included golf, dinner, and entertainment, was held at the Carmel Country Club, Carmel, N. Y., with Kenneth Parks, Manager of Sales Development for the Caterpillar Tractor Co., as master of ceremonies.

All manufacturers have an accumulated backlog of orders for post-war delivery dating almost since the beginning of the war; and since V-J Day the amount of orders has been so great that the demand cannot possibly be met before many months, the discussions revealed. Engineering changes, strike difficulties, and shortages of materials all contribute to upset production schedules. Strikes may not actually occur in the manufacturer's own plant, but in one of his sources for a minor, if necessary, piece of equipment. A nation-wide shortage of castings is also providing a great bottleneck, various officials stated. One man told of traveling through six states for a month with thousands of dollars' worth of orders and not being able to place a man's worth.

Among the guests were: William Bigler, Eastern Sales Manager, and William Muller, New York Representa-

tive, Caterpillar Tractor Co.; J. A. Penote, Sales Manager, and J. R. Overs, Sales Engineer, Cleveland Trencher Co.; S. Myers, Vice President, and Kenneth Turner, Washington Manager, LaPlant-Cheate Mfg. Co.; Leslie Jones, Eastern Sales Manager, and Henry J. Vines, District Representative, Bucyrus-Erie Co.; Theron Howard, Advertising Manager, and Kenneth Bliss, District Representative, Hyster Co.; Robert Bremner, General Sales Manager, T. L. Smith Co.; Edward I. Stouffer, District Representative, Athey Products Corp.; N. E. Jenks, District Representative, Trackson Co.; B. M.

Clark, General Sales Manager, Heltzel Steel Form & Iron Co.; F. L. Hoover, District Sales Manager, Huber Mfg. Co.; Deane Mitchell, Sales Manager, Novo Engine Co.; Joseph C. Fiorelli, Sales Manager, Friend Mfg. Co.; R. G. Heckathorne, District Representative, John Deere Plow Co.; E. R. Galvin, President, Tyson Bearing Corp.; William Warner, Special Representative, and Clancy M. O'Dell, District Representative, Gardner-Denver Co.; and more than forty members of the H. O. Penn organization's branches in New York City, Mineola, and Poughkeepsie, New York, and Newington, Conn.

New Airpark Planned

A contract for a survey and the design of an airpark at Delray Beach, Fla., has been awarded to Airways Engineering Consultants, Inc., Washington, D. C., by the Airpark and Personal Aviation Development Corp., Washington. The planning will cost \$7,500.

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...IN 8 AND 14 YARD SIZES!

Easier Loading
Because of generous initial apron opening without movement of rear gate. Curved bowl design plus smooth interior and special offset cutting edges produce continuous "fountain action" in loading, while exclusive eccentric hoist sheaves permit effective "pumping" in loose material.

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Thanks to lower draft, shorter wheel base and elimination of excess weight. Newly designed apron retains load under all conditions.

Faster, Cleaner Dumping
Because of positive forced ejection. Rear gate actually bulldozes the material out, scraping bottom and sides of bowl perfectly clean. High lifting apron moves ahead with rear gate, assuring speedy unloading of all materials, without sticking or jamming.

More Accurate Spreading
Assured by improved positive control.

Greater Stability
Thanks to low center of gravity and freedom from bulky overhead structures.

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Because wide, open-top bowl also permits overhead loading with shovel, drag-line or bin.

COMPLETELY NEW FROM THE GROUND UP AND THOROUGHLY PROVED BY 2 YEARS OF TESTING

Everyone who has seen these new LaPlant-Cheate scrapers in action has been quick to admit that "they have all the good points of other rigs—and a lot more besides." Moreover, on scores of tough earthmoving jobs from coast to coast, these greatly improved cable outfits are proving far superior to competitive equipment in all phases of operation. But don't take our word for it. Ask your nearest LaPlant-Cheate "Caterpillar" distributor to take you to see the new LPC's working. Then you'll learn why so many agree on LPC for lowest possible cost per yard—wherever tractor-drawn scrapers are indicated. LaPlant-Cheate Manufacturing Co., Inc., Cedar Rapids, Iowa; San Leandro, California.

*Reg. U.S. Pat. Off.

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EARTHMOVING AND LAND CLEARING EQUIPMENT

**Fiftieth Anniversary
Celebrated by Barnes**

Fifty years ago the Barnes Mfg. Co. began making hand-operated pumps in a small one-room plant at Mansfield, Ohio. Today the firm occupies plants covering 40 acres, devoted to the production of a highly diversified line of automatic centrifugal pumps, Y-strainers, silver brazing flanges, aircraft fuel servicing nozzles, sand castings, die castings, and many other precision machine products.

To celebrate its golden jubilee, the firm has published an illustrated book-

let which not only traces Barnes' accomplishments over the half-century, but also presents the first record of the company's wartime activities. Plans for the future are also told.

Copies of the Golden Jubilee booklet may be secured by writing direct to the Barnes Mfg. Co., Mansfield, Ohio.

Lubrication Booklet

Owners and operators of trucks will find useful and interesting an illustrated 40-page booklet, "Truck and Bus Lubrication", just issued by the Sinclair Refining Co. Copies may be obtained

by readers who address the firm at 630 Fifth Ave., New York 20, N. Y., and mention this review.

The booklet discusses the advances made in truck engines and lubrication since the advent of the automobile. The philosophy, principles, and practices of combustion engineering are noted briefly. Characteristics to be sought in choosing a motor oil for a particular job are outlined, with hints on how to overcome knock, carbon, and other undesirable features of unwise motor-oil usage. The "whys" and "wherefores" of motor-oil deterioration are thoroughly discussed.

Qualifications and characteristics of Sinclair oils, how they are best used and charts indicating the oil for a particular task are all included. A discussion of power transmission, and specimen maintenance records round out the presentation.

Sasgen Succeeds Father

M. F. Sasgen, for many years Vice President and General Manager of the Sasgen Derrick Co., Chicago, has been named by the firm's Board of Directors to succeed his deceased father, Michael J. Sasgen, as President and Treasurer.

STILL YOUNG

At 45,000 hours



As the hour-meters on "Caterpillar" Diesel Engines, Tractors and Motor Graders roll up work records of 20, 40 and even 50 thousand hours, the evidence of sound planning, correct engineering and quality manufacturing grows more and more impressive.

What were once considered unusual life spans in power equipment are rated today as "normal expectancies" in "Caterpillar" Diesels. It is when "outside" comparisons are made that their outstanding endurance and performances are fully appreciated.

Typical examples of "Caterpillar" Diesels' long, serviceable life are pictured here. At the time their hour records were reported, the units were still "going strong" and, according to their operators, far from the end of their career.

CATERPILLAR TRACTOR CO. • PEORIA, ILL.

(Top)

45,000 WORKING HOURS is the record of this old "Caterpillar" Diesel Forty Tractor. Owners: Baragar Bros., Contractors, Elm Creek, Manitoba. Used with bulldozer, scraper, blade and elevating grader—on road building and airport contracts, winter freighting, and general farm work. Owner says, "Does twice as much work—and at half the operating cost—as the tractor it replaced."

(Bottom)

18,200 WORKING HOURS is the record of this husky "Caterpillar" Diesel No. 11 Motor Grader. Owner: Pratt County, Kansas (R. A. Peterson, County Engineer). Used for grading, snow-plowing and general road maintenance. Mr. Peterson says, "Operates at 60% of fuel cost and does twice as much work as the equipment it replaced."

22,000 WORKING HOURS is the record of a Diesel Seventy-Five Tractor this progressive county owns.

At 19,200 hours



CATERPILLAR DIESEL

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THE DISCHARGED VETERAN WEARS THIS EMBLEM
REMEMBER HIS SERVICE AND HONOR HIM

Well Selected Tools Speed Road Widening

Two-Foot Concrete Strips Added to 20-Foot Road Before Laying Plant-Mix Bituminous Black-Top

HEAVILY traveled U. S. 9W, important north-south route between Albany and New York City on the west bank of the Hudson River, was improved last summer for a distance of 6.36 miles by widening its 20-foot pavement to 24 feet, and then covering the entire pavement with two courses of asphaltic concrete. A contract for this work was awarded by the New York State Division of Highways, District 1, to the Lane Construction Co. of Meriden, Conn., on a low bid of \$156,801. The job extended from Ravena to Beckers Corners in Albany County.

The existing 20-foot road, an 8-inch uniform reinforced-concrete pavement, was built fifteen years ago, and in 1941 a section of it had been given a double bituminous surface treatment. Because of the large volume of traffic, particularly heavy trucks, traveling over this route, the extra 2-foot strip on each side is essential to safe driving.

Trench Cutting

The 2-foot widening strips consist of a 8-inch ribbon of plain concrete laid on an 8-inch course of run-of-bank gravel to provide an easily drained stable sub-base. In order to make the deep cut alongside the existing pavement for the addition to the slab, the contractor used two shovels, and two power graders with special attachments to their blades. By using a sufficient amount of equipment, which was ideally adapted to the work at hand, the trenching operations progressed smoothly and efficiently so that neatly trimmed trench was always well ahead of the paving crew. In this area, where the brick-making industry once thrived on a large scale, the soil as might be expected is a heavy clay which could be excavated with any degree of ease only by a power shovel. Accordingly, the trench was dug by a Bucyrus-Erie 20-B shovel with a $\frac{3}{4}$ -yard bucket which had a width of 3 feet. This size was required to make a trench with sufficient room in which to set the paving forms. The depth of the averaged 16 inches. Along this road, however, on curves and fills there is considerable guard rail which is set only 4 feet from the edge of the pavement, preventing the use of the Bucyrus-Erie crawler-type shovel in these sections. Consequently a Michigan MCT-16 truck-mounted power shovel with a $\frac{1}{2}$ -yard Trench Hoe only 2 feet 3 inches wide, was used to dig the trench in those sections of the road protected by guard rail. The smaller but more mobile truck shovel was better suited for excavating in these constricted areas than was the crawler-type shovel, which did its best work when trenching in the clear astride the road.

Following behind the shovels came a Caterpillar No. 10 power grader whose foot blade was fitted out with a special drop section, 16 inches deep and 3 feet wide, bolted to the bottom of the regular blade. In this way, the trench was cut to exact dimensions, fine-grading the work of the power shovels, and increasing to 3 feet the width of the trench dug by the truck shovel along the guard rail. In some instances where the larger shovel had worked too deeply, this special blade pulled back to the trench excavated material from one side so that the depth of cut would be uniform throughout. During this operation the power grader moved along

the pavement with its outside wheels riding close to the edge of the slab.

Gravel Sub-Base

The 16-inch-deep trench was then filled with run-of-bank gravel to a loose depth of 9 inches which compacted under rolling to 8 inches, or half the depth of the trench. The gravel was purchased from and delivered by the Albany Sand & Gravel Co. from its Van Rensselaer bank in North Albany, 15 miles to the north. An average of eight trucks, each holding 5 yards of gravel, hauled the material to the job and spot-dumped the loads about every 12 feet on that half of the pavement which was being widened. Throughout all construction operations traffic was maintained as usual on the other half of the



C. & E. M. Photo

A special blade on a Caterpillar No. 10 power grader pushed gravel for widening-strip sub-base into the trench, followed by a Buffalo-Springfield 3-ton trench roller.

road.

Although the long gravel haul by trucks might appear uneconomical, such was not the case since the gravel trucks picked up a payload of crushed stone from the Callanan Quarry at South

Bethlehem, 2 miles west of the center of the project, and hauled it back to the North Albany plant where it was sold commercially.

Another Caterpillar No. 10 power (Continued on next page)

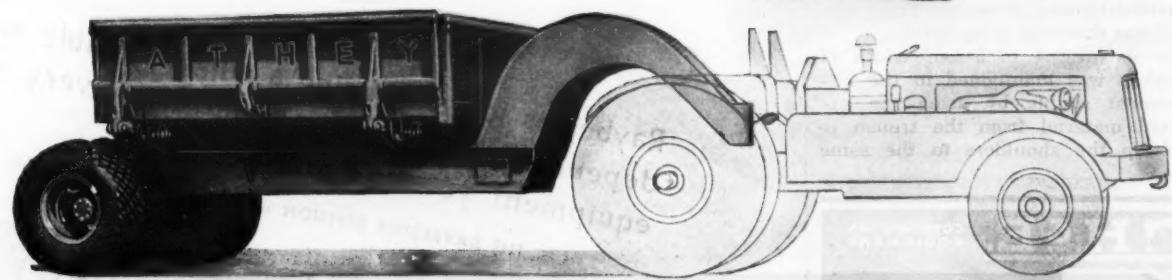
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DEPENDABLE LOADING & HAULING EQUIPMENT



C. & E. M. Photo

Lane Construction Co. used a two-screed rodding machine to vibrate and finish concrete widening strips on a section of U. S. 9W in District 1, New York State.

Well Selected Tools Speed Road Widening

(Continued from preceding page)

grader pushed the gravel off the concrete pavement into the trench and, by means of a special drop section bolted to the blade, leveled off the gravel to the proper grade. Like the other attachment, this section was also 3 feet wide and only 7 inches deep, thereby insuring the bottom of the trench being filled with 9 inches of loose material. As these special drop sections were bolted to the regular grader blade, they were interchangeable on either machine, permitting full-depth trench trimming to be done by either grader, or else either could be used on gravel spreading as the progress of the work directed. The attachments could also be bolted at either end of the blade, depending on the side of the road being worked.

Immediately behind the power grader which was spreading the gravel came a Buffalo-Springfield trench roller powered by a Waukesha engine. This 3-ton 3-wheel roller, two wheels in the trench and a smaller wheel riding the pavement, compacted the gravel a full inch with two or three passes along the trench, so that a solid 8-inch sub-base was obtained.

Drainage at Joints

At the bituminous expansion joints, which occurred every 78 feet 6 inches in the concrete pavement, considerable trouble had been caused by pumping, resulting from inadequate subsurface drainage to the ditch lines. To overcome this condition, weep or French drains were installed at each joint, extending from the edge of the new slab to the ditch. The drains consist of crushed stone with a gradation range from $2\frac{1}{4}$ down to $\frac{1}{2}$ -inch and have an average thickness of 9 inches and a width of 5 feet, or $2\frac{1}{2}$ feet on each side of the joint. Rough excavation for these drains was done by the shovels followed by hand trimming, while the drain material was shoveled in by hand.

The existing 4 to 5-foot width of shoulders was maintained in the improvement simply by using the excavated material from the trench to build up the shoulders to the same

width. In cut sections the shovels and graders enlarged the ditches whenever necessary and dispersed any excess material along the fills.

Concrete Paving

On top of the 3-foot gravel sub-base Blaw-Knox steel forms were then set by hand 2 feet off the old pavement and oiled. At least 1,000 feet of forms were always ready ahead of the paving operations which used concrete purchased from the Ready Mix & Supply Co. The concrete was delivered by this company in four Rex Moto-Mixers, one 5-yard, one 4-yard, and two 3-yard, mounted on White and Autocar truck chassis. The five-bag batches were mixed at the plant in Albany for $1\frac{1}{2}$ minutes and then dumped into the Moto-Mixers for further agitation lasting about 45 minutes, the time required to make the 15-mile trip.

The concrete was chuted directly into the forms from the truck-mixer as it moved along the side of the road while three puddlers with shovels kept the flow evenly distributed. When the truck was empty, two of these puddlers pulled a double-screed rodding machine powered by a Wisconsin engine over the freshly dumped concrete, while

the third puddler saw that material was kept in front of the screed as it advanced.

The two vibrating screeds were 6 feet long and 2 feet apart and were pulled by a metal drawbar. At the front of the machine preceding the screeds was a metal wheel which ran against the inside of the form, imparting a spading action to the concrete. This machine with its double screeds working back and forth across the concrete did practically all the finishing with the exception of the final hand floating, which was done by the fourth member of the concrete crew who also dragged a fiber broom across the surface of the strip to roughen it for better bonding with the black-top material with which the concrete was later surfaced.

Expansion joints of 1-inch impregnated felt were placed in the 2-foot concrete strips to match the joints in the existing pavement. The expansion joint was backed by a metal plate the same size as the joint, and supported by

(Concluded on next page)

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MANUFACTURER of FULL METALLIC, SEMI-METALLIC, WOVEN and MOLDED FRICTION MATERIALS.

Well Selected Tools Speed Road Widening

(Continued from preceding page)

A couple of form pins until the concrete had been poured. Then the plate and machine back were removed by the finisher.

The five-bag batch of concrete used in this pour consisted of:

Cement	470 lbs.
Sand	1,285 lbs.
Gravel, $\frac{1}{2}$ to 2-inch	2,150 lbs.
Water	30 gals.

The concrete was cured with Curing compound sprayed on from a portable 50-gallon tank, and although the road forms were removed within 24 hours, traffic was kept off the pavement for 10 days. To prevent cars from running on the new strip, stones expansion were placed along the edge at intervals of every 100 feet. The contractor had as many as 400 lanterns on the job, for though the 10-hour daily average of work was 1,500 feet of 2-foot concrete, his figure increased at times to 2,500 feet when the material was flowing freely to the job site. Consequently the large number of lanterns was needed to protect the long stretches of concrete which was being cured for days.

Black-Top Surface

Before laying the bituminous hot-mix, loose material from the existing surface treatment was swept from the road with hand brooms, and the transverse expansion joints were cleaned out to a depth of 1 inch with picks and then refilled with the new paving material. The asphaltic concrete, mixed by the Steamix Process, was purchased from the commercial plant of the Calcan Road Improvement Co. at Feura Bush, N. Y., about 5 miles from the center of the job and was laid in two layers, the base course being about 1½ inches thick and weighing about 140 pounds to the square yard, and the top course nearly 1 inch thick with a weight of 90 pounds to the square yard. The total thickness of both layers after being compacted measured nearly 2½ inches. The plant-mix was laid by an automatic Black Top Paver in one 10-foot wide 2-foot lanes.

Quantities and Personnel

The major items in this 6.36-mile contract included:

Excavation	14,000 cu. yds.
In-of-bank gravel	4,900 cu. yds.
Concrete, 8-inch	3,400 cu. yds.
Crushed stone, $\frac{1}{2}$ to 2½-inch	2,400 tons
Bituminous plant-mix	12,050 tons

A working force of 52 men for all operations was employed by the Lane Construction Co., under C. S. Phillips, superintendent, on this project which was under way on April 16, 1945. Black-top work began around the first part of May and the road was finished early in September.

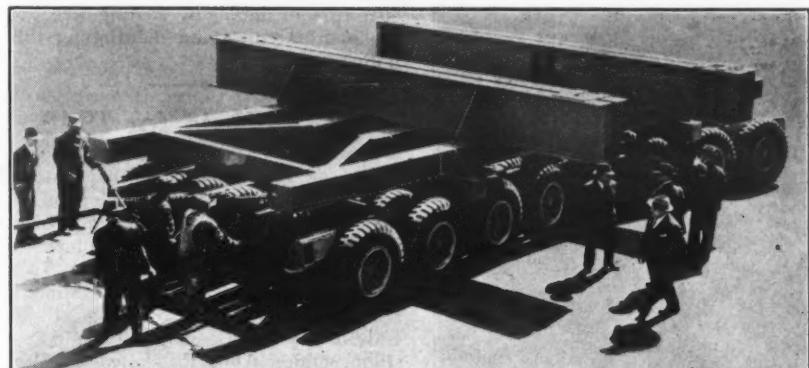
District 1 of the New York State Di-

vision of Highways, where this construction took place, is headed by District Engineer Peter J. Lamb. The project was under the direction of John J. O'Hara, who is in charge of the construction program in this District. W. A. Albright was Resident Engineer on the job.

A Super-Colossal Equipment Trailer

A 300-ton load, the heaviest single burden ever moved on pneumatic tires, was carried on a huge trailer designed and built in 30 days by the Rogers Brothers Corp., Albion, Pa., for use on a secret military project. Mounted on 64 wheels, the super trailer is over 39 feet long, almost 17 feet wide, and weighs 73 tons. The load was supported in transit by 25-foot-long steel cross beams on the chassis.

The 64 wheels were mounted in 8 rows, and equipped with 14.00 x 24-inch military truck tires made by the B. F.



This special 64-wheel trailer carried a 300-ton load, the heaviest which has ever been moved on pneumatic tires.

Goodrich Co., Akron, Ohio. A special 18-ply desert type, the tires were made of synthetic rubber and rayon cord. Each casing weighed 220 pounds. The load was moved 30 miles over a temporary sand road at a speed of 3 mph, with a deflection of 3/32 inch in the main members. Each tire was inflated

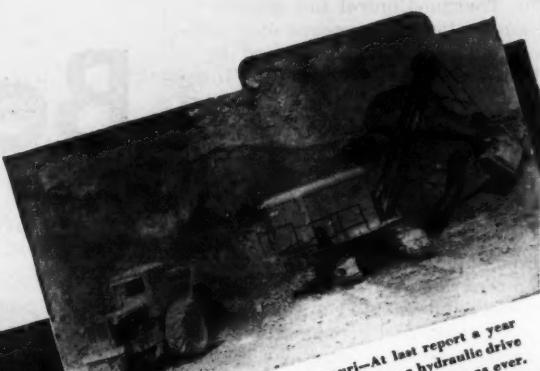
to 39-pound air pressure. According to Goodrich engineers, a load of 556 tons could be transported easily on a 90-pound tire pressure over an improved road at one mph.

Too huge for movement over highways, the giant trailer was built in sections for shipment on flat cars.

First WITH HYDRAULIC DRIVE



Joseph Keel, Rental Equipment Co., Missouri—Used a hydraulic drive Lorain 82 in gumbo and sand constantly for 4 years, says, "We have operated 7 makes of draglines and my honest opinion is that Lorain tops them all!"



La Clede Christy Brick Co., Missouri—At last report a year ago had piled up 6,000 hours in 2 years on a hydraulic drive Lorain 82—4 years' work in 2—and still going as strong as ever.

LOOK AT THIS RECORD...



Liberty Limestone, Virginia—Four years, 9 hours a day, 26 days a month—rock all the way—reports, "Simple, durable and satisfactory!" Has purchased a second L 82 to prove it!



Contractors Service Corp., Pennsylvania—handled 3,000,000 tons of rock a year with 5 Lorain 82's—50,000 tons a month per shovel for 12 months straight!

...AND STILL FIRST AFTER 5 YEARS!

There's no substitute for experience! And today when hydraulic drive is just coming into its own in construction equipment, Theew—who pioneered it in the shovel and crane field—can offer you tested hydraulic coupling equipped machines with 5 years of tough concentrated field work behind them!

Here—in the 2-yard Lorain 82—is hydraulic drive at its peak. You can't shock this shovel. Slam the dipper into the pile or tie into the biggest rock and the Lorain-engineered hydraulic coupling absorbs shocks and strains—reduces maintenance by lengthening machinery life. Not only that! The power hangs on like a bulldog till the rock is in the dipper—the engine never stalls.

Hydraulic drive plus Theew Center-Drive direct-to-the-point turntable power application; two speed chain drive crawler; all-steel, all-welded boom; all-steel dipper stick and new, one-piece, streamlined dipper make the "82" ideal for rock and other tough work.

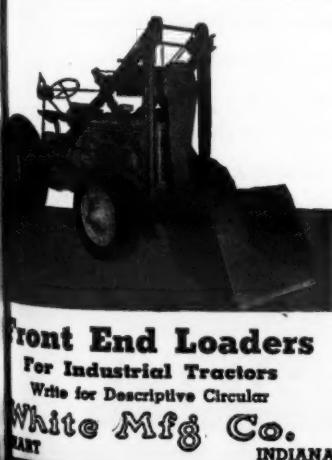
Hydraulic drive can save you plenty! Be sure you get it at its tested best—in a proven Lorain 82. Ask your Lorain distributor for details today.

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Write for Descriptive Circular
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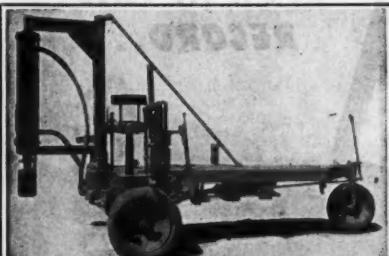
A feature of the new Evans Thermo-Control engine fan is the automatic adjustment of pitch for more uniform temperature distribution throughout the engine compartment.

Engine Fan's Pitch Thermo-Controlled

A thermostatically controlled engine fan, shown by laboratory and field tests to be an improvement in controlling the temperature in internal-combustion engines, has been announced by the Evans Products Co., 15310 Fullerton Ave., Detroit 27, Mich. The device has its principal applications on trucks, stationary gasoline and diesel engines, tractors, shovels, and similar heavy equipment.

The Thermo-Control fan adjusts itself automatically by means of a variable pitch control accomplished by a built-in heavy-duty Vernatherm Thermal power element. The Vernatherm changes the fan's pitch, through infinite variations, to the maximum needed for the job. This results in great power saving, the Evans firm says. The elimination of wide variation in the temperature of the coolant, common in combustion engines, not only reduces the amount of horsepower used but also cuts down on excessive wear on the engine and on fuel consumption. The Thermo-Control fan lengthens the life of the lubricating oil and of the oil filters, and makes cracking of cylinder heads and piston failures less frequent, it is claimed.

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cure further details by writing direct to the manufacturer and mentioning this notice.

ARBA Slate for 1946

James J. Skelly, President of the American Road Builders' Association, has been nominated for reelection to that office for 1946, the Committee on Nominations for the Association has announced. Choices for the four Vice Presidencies are: Paul B. Reinhold, Reinhold & Co., Pittsburgh, Pa.; E. R. Galvin, Tyson Bearing Corp., Massillon, Ohio; Alex F. Hancock, Alex Hancock Construction Co., Mobile, Ala.; and Robert A. Allen, State Highway Engineer, Carson City, Nev. H. C. Whitehurst, Director of Highways for the District of Columbia, has been re-named for Treasurer.

Nominees for directorships to end in 1949 are: R. H. Baldock, Oregon State Highway Engineer; Robert B. Brooks, Consulting Engineer, St. Louis, Mo.; J. F. Cast, Representative, Firestone

Tire & Rubber Co., Cleveland, Ohio; Bernard Gray, General Manager, The Asphalt Institute, New York City; W. W. Polk, Chief Highway Engineer, Illinois; A. R. Taylor, Consulting Engineer, Tarmac Dept., Koppers Co., Pittsburgh, Pa.; and Nello L. Teer, Jr., President, Mecklenburg Construction Co., Durham, N. C.

Rototiller Production To Go Into Full Swing

Plans for the production of a minimum of 50,000 Rototillers during the first full year of operation of the Willow Run plant near Detroit have been announced by the Graham-Paige Motors Corp. Manufacturing and sales rights to the Swiss-invented implement have been obtained by the firm from Rototiller Inc., Troy, N. Y. Used for soil-cultivation work for road bases, at airports, and for roadside ditches, for preparing shoulders and roadside areas before seeding, and for farming, the Rototiller has been re-engineered by Graham-

Paige.

Designed to prepare the ground for immediate planting in a single operation, the machine has been placed in mass production because of the demand for it, company officials say. An order for more than \$1,000,000 has been placed with the Bell Aircraft Corp., Burlington, Vt., for the manufacture of Rototiller engines. A line of attachments is being prepared to adapt the Rototiller for mowing, furrowing, cultivating, planting, snow-plow work, and as a portable power plant for the operation of circular saws and other light machinery.

New Schramm Dealer

The Standard Equipment & Supply Co., 2600 E. Sixth St., North Little Rock, Ark., has been appointed distributor for Schramm, Inc., West Chester, Pa. The new outlet will handle the entire line of Schramm air compressors and tools and will provide complete compressor service.

SINCLAIR OFFERS YOU THIS GUIDE TO Better Lubrication

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"**TRUCK and BUS LUBRICATION**," a 40-page brochure, aims at better understanding and solution of lubrication problems in the truck and bus fields. It discusses such vital subjects as specific lubrication requirements . . . causes of motor oil deterioration in service, and preventive measures . . . characteristics of

motor oils and greases, and proper selection for correct lubrication of parts.

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Old Levee Rebuilt

(Continued from page 1)

The new levee has a net grade of about 424 elevation and an average height of about 18 feet above the natural ground. The finished flat crown is 30 feet wide, from which the river and land-side slopes descend with a 1 on 3 gradient; the width through the base is from 120 to 130 feet. In the areas where borrow was taken a berm was built a few feet above the bottom of the riverside slope, dropping with a 1 on 50 slope for 40 feet, and then more sharply with a 1 on 3 to natural ground. The borrow material was taken from an area 20 feet beyond this point towards the river which lies about $\frac{1}{2}$ mile away to the west. The original protection of the levee was restored before the spring flood season, and as completed its crown is about 14 feet above flood stage at this point on the river.

Borrow Excavation

The material in the borrow pits was a sandy silt deposited by the river over centuries of flow. The length of the borrow pits measured from the riverside toe of the berm in the direction of the river varied from 100 to 200 feet, while the depth of the cut varied from 10 to 15 feet and was excavated so that the bottom of the pit would have a 1 on 25 slope towards the river. The average length of haul was 300 to 400 feet, with a maximum haul of 1,000 feet. A particularly heavy fill was required at the crevasse in the old levee where a "blue hole", a deep crater formed by the gouging erosive action of the flood waters, had been formed. This blue hole was about 400 feet wide, 200 feet long, and 20 feet deep.

Before filling operations began on the levee, an inspection ditch, 7 feet wide x 6 feet deep, running lengthwise of the levee and just off the center line, was dug in order to detect any drains that might exist across the new location of the levee, or any debris that might possibly be buried in the base. The ditch was excavated by a Lima dragline with a 40-foot boom and a $\frac{3}{4}$ -yard Page bucket. Borrow-pit excavation was done by a Lima No. 8 dragline with an 8-foot boom and a $3\frac{1}{2}$ -yard Hendrix perforated bucket.

During the winter operations, a LeTourneau one-tooth scarifier weighing 5 tons was used to plow a 3-foot furrow in the hard ground to help the excavating equipment. This scarifier was mounted on skids and was pulled by one Caterpillar D8 tractor and pushed by another.

Placing the Fill

The long hauls of 1,000 feet from the borrow pit to the levee fill were made by two bottom-dump Euclids which carried a heaped load of from 14 to 15 cubic yards but whose struck-load capacity is 12 yards. Four bucketfuls of



C. & E. M. Photo

For winter work, the tractors on the Kraus levee contract were enclosed with tarpaulins to throw back some of the engine heat for the benefit of the driver.

the dragline filled the Euclids and sent them on their way. Also working on the long hauls were two Tournapulls which carried 12 yards of material although their water-level capacity is rated at 10 yards. They were also loaded by the dragline. These two types of self-powered rubber-tired units operated at an average speed of 10 mph

over the rough ground and moved about 25 per cent of all the levee fill.

To keep in shape for his mat engagements, Warren Bockwinckel, 240-pound St. Louis contender for the heavyweight wrestling title, operated one of these Tournapulls and claims the bouncing around he got going over the rough ground was an excellent condi-

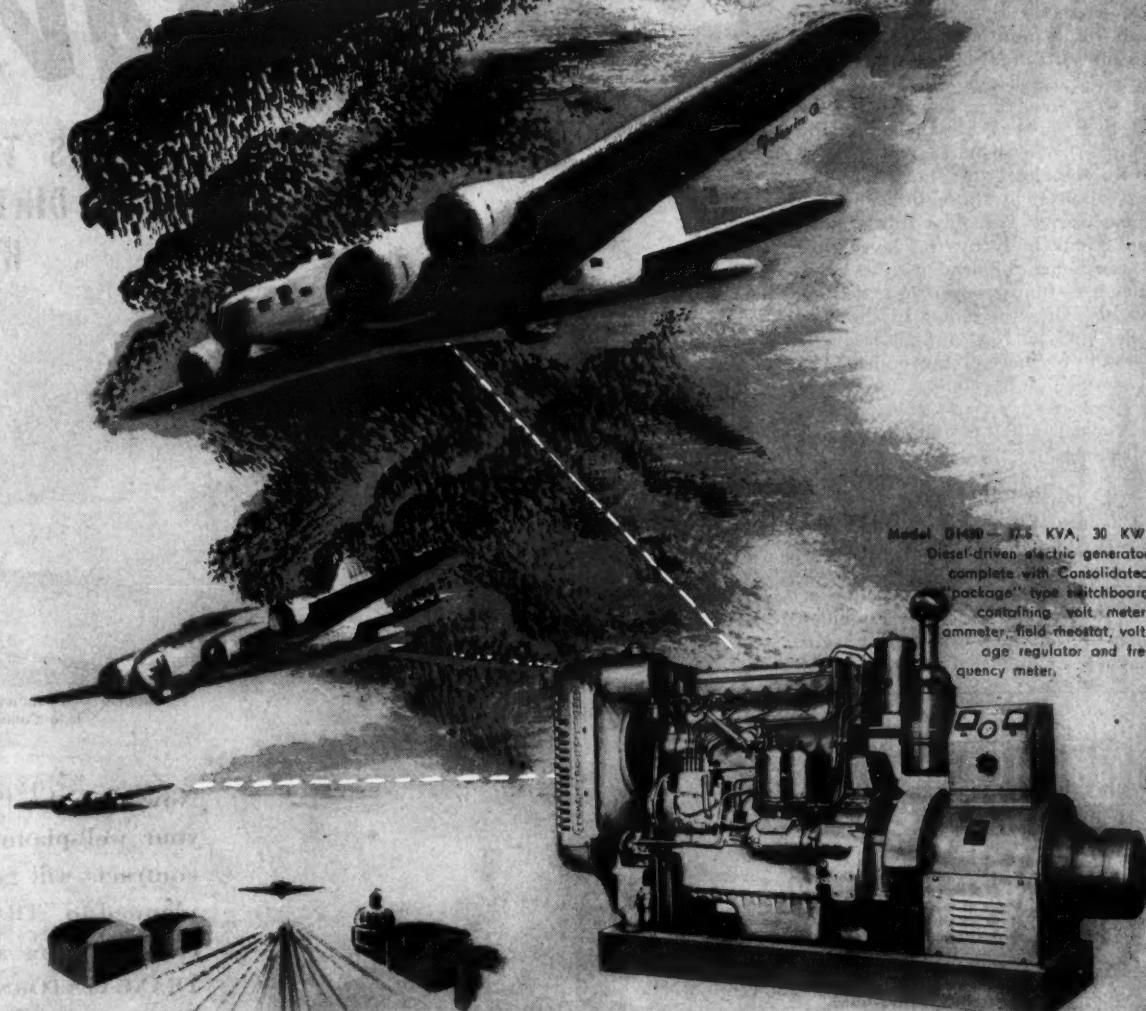
tioner.

For the shorter 300 to 400-foot hauls, the contractor used a fleet of six LeTourneau 12-yard Carryall scrapers pulled by Caterpillar D8 tractors. Another Caterpillar D8 worked in the borrow pit as a pusher, helping the scrapers to load up. These units operated at an average speed of 4 mph and placed about 75 per cent of the levee fill. During the winter the tractors were enclosed with tarpaulins in order to throw some of the engine heat back to the operators and keep at least the lower half of their bodies warm.

The fill was placed in 1-foot layers and compacted by at least four passes of a LeTourneau double-drum 4-foot-diameter sheepsfoot roller pulled by an Allis-Chalmers Model L tractor. An average of 10 per cent excess fill was placed in the levee embankment so that when the natural shrinkage occurs the net designed grade will still be retained.

An average of 5,000 cubic yards of material was placed in a 9-hour day in
(Concluded on next page)

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Diesel-driven electric generator
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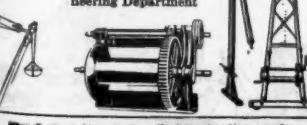
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SASEGEN DERRICK COMPANY
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Old Levee Rebuilt

(Continued from preceding page)

the construction of this levee with a force of 20 men. The severe winter through which work was carried on whenever possible kept this production figure low, yet the slow but steady winter progress produced results, so that by spring the levee was in condition to withstand the usual high water.

In the spring the surface of the levee, including the berms, was harrowed and dressed and then received the following seed mixture per acre:

Redtop	10 lbs.
Timothy	10 lbs.
Canada bluegrass	15 lbs.
Domestic rye	5 lbs.
Total	40 lbs.

Substandard Levees

The repairs to this substandard levee, together with strengthening it to a section and grade approved by the War Department, were authorized by the 1944 Emergency Repair Act of Congress. After the 1943 floods, only enough money was appropriated to repair the damage done to the levees, with no provisions included to strengthen them. When the 1944 floods topped and smashed through these repaired levees, Congress then made available enough funds not only to repair the levees but also to strengthen them.

During these floods the levees that failed were not those constructed by the U. S. Engineers, but those built by individual levee districts which were 10 to 12 feet lower and of a smaller cross section than those built by the Engineer Corps. The older substandard embankments built by the levee districts are being replaced by the U. S. Engineers as funds are made available. All of this work was halted by the war, and the floods of 1943 and 1944 caught this section of the country unprepared with adequate levees along the entire front. Post-war construction of approved levees will check the menace of the Mississippi at flood time.

Personnel

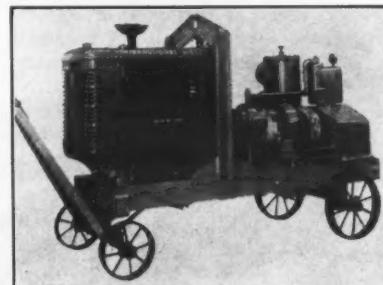
The 3-mile Wilson and Wenkel and Prairie Du Pont levee of 900,000 cubic yards was constructed at a contract price of \$243,000 under the direction of the St. Louis District, U. S. Engineer Department, of which Col. L. B. Feagin is District Engineer, Lt. Col. J. A.

Adams is Deputy District Engineer, Lt. Col. E. H. Shutt is Executive Officer, and Lt. Col. W. F. Lawlor, Chief Engineer of the Engineering Division. Capt. L. F. Trost is Engineer in charge of flood control, with C. J. Weaver as his assistant. L. E. Dillow is Assistant Engineer on the earth-work and drainage section.

C. J. Arnold was Superintendent on the construction of the levee for Samuel Kraus, the contractor. R. M. Neal was Resident Engineer and H. Louvall, Inspector for the U. S. Engineers.

New Wellpoint Pump Is Diesel-Equipped

A new model wellpoint pump, featuring diesel power, has been announced by the Griffin Wellpoint Corp., 881 E. 141st St., New York 54, N. Y. Due to the increased horsepower provided by an International UD-9 engine, this Model 108-D delivers 2,800 gpm, which is 300 gpm greater than its former rat-



The new Griffin wellpoint pump is powered by an International UD-9 diesel.

ing when gasoline-powered. This Vac-U-Matic 10 x 8 pump incorporates many mechanical improvements, particularly the elimination of all packing in the stuffing box.

As wellpoint pumps operate 24 hours a day, the application of diesel power is particularly suited to this type of service, Griffin points out, claiming to be the first dewatering company to offer this feature in a standard pump. This model, like the complete line of Griffin

dewatering systems, is available for sale or for rent on the larger wellpoint jobs.

A catalog, "Griffin Pointed Wellpoint Facts", may be secured by CONTRACTORS AND ENGINEERS MONTHLY readers who mention this item in writing to the firm.

Twin Disc Appointments

N. F. Adamson, General Sales Manager for the past two years, has been named Vice President in charge of sales and engineering of the Twin Disc Clutch Co., Racine, Wis. Chief Engineer for the company for many years, Mr. Adamson has been with the organization more than two decades.

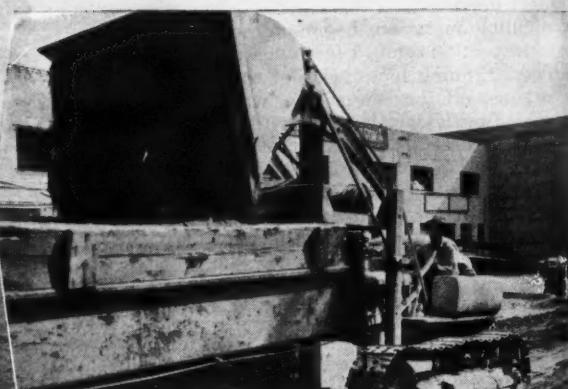
To provide closer coordination of engineering, sales, and service activities at the Racine and Rockford divisions, other appointments have been made as follows: E. C. Billings as Sales Manager, and G. W. Buelke, Chief Engineer of the Racine Division; and Roger G. DeLong, Sales Manager of the Hydraulic Division, with headquarters at Rockford, Ill.

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T-4 TRAXCAVATOR digging and loading material for road surfacing in Alabama at a rate of 60 yds. per hr.



Digging and loading old alley paving in a California city



T-7 TRAXCAVATOR digging through 12 inches of frost for Long Island, N. Y. housing project

Now that the "go-ahead" signal has been given, your well-planned construction and maintenance contracts will get off to a flying start if you have planned to "TRAXCAVATE" — for it's the modern earth-moving and material-handling method. TRAXCAVATORS, the dependable tractor excavators, combine in one machine the usefulness of a Shovel, Loader, Scraper, Bulldozer, Anglegrader, etc. There's a wide choice of models with bucket sizes from $\frac{1}{2}$ to $2\frac{1}{2}$ cubic yards. Your nearby TRACKSON "Caterpillar" dealer will be glad to give you the complete story, or write for informative literature to TRACKSON COMPANY, Dept. CE-12, Milwaukee 1, Wisconsin.



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FOR ALL TYPES AND MODELS OF SNOW PLOWS

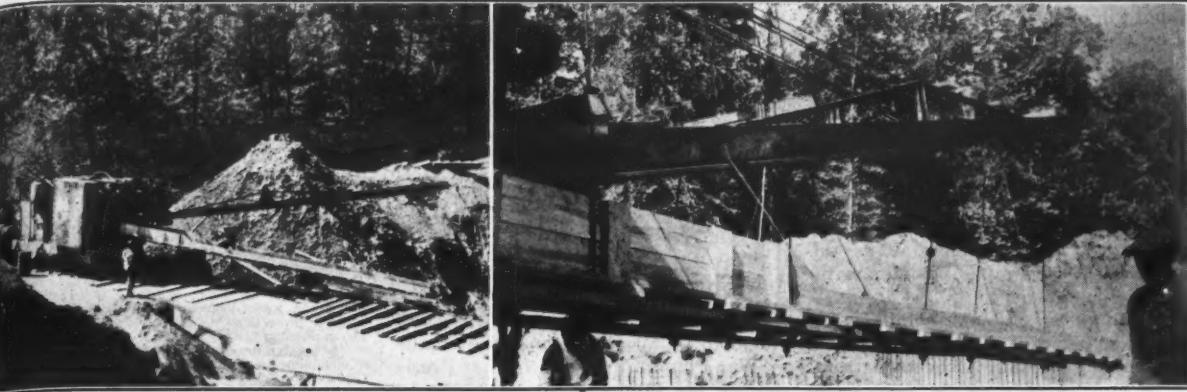
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C. & E. M. Photo
To solve the problem of placing concrete in footings at three different levels, B. W. Jackson, contractor for a grade separation on the Colonial Parkway in Virginia, devised a heavy wood chute attached to the Ransome 34-E paver. At left, the chute in place; right, a close-up of the device, showing the high side boards at the paver end and the tie-rod suspenders.

Bridge Concreting Is Aided by Chute

Paver Carried Heavy Wood Chute for Depositing the Footing Concrete at Three Levels on Cut-Off Project

A NOVEL method of handling concrete was used by B. W. Jackson, contractor, on a grade-separation structure to carry a shorter section of Va. 168 over the Colonial Parkway built and maintained by the National Park Service. The new location of Va. 168 bypasses several small towns and this newest cut-off shortens the by-pass still further.

The Colonial Parkway is part of the National Monument which includes the historic communities of Williamsburg and Yorktown of Revolutionary days which have been restored by the Rockefeller Foundation and National Park Service, respectively. Where the newest state highway cut-off crosses the Parkway, the difference in roadway grades is about 25 feet and the structure designed by the Park Service has three sets of footings at different elevations on one side and two on the other, the latter being connected by reinforced-concrete beams which carry the U-shaped retaining walls. These walls, like the balance of the structure, are finished with a brick veneer in colonial style, even to the intrados of the arch.

Contractor's Problem

To deliver the concrete to the footings at three elevations on one side without segregation was the contractor's main problem. He solved it by means of a heavy wood chute attached to the boom of his Ransome 34-E paver. The footings on the two upper levels were poured with the paver at the grade of the new highway, and the lowest footings, 10 feet below parkway grade, with the paver on the park roadway, running on 3 x 8-inch timber to prevent damage to the concrete highway by the crawlers.

The wood chute was 30 feet long, with an additional 10-foot hinged section at the end. It was built 30 inches wide of 1½ x 8-inch lumber for the bottom and sides and two boards high

for the first 12 feet to prevent loss of concrete as it was discharged from the paver drum into the chute. It was lined with sheet metal to reduce friction, and baffled to prevent segregation of the concrete.

The novel method of hanging the chute from the boom of the paver is of considerable interest. The contractor used ½-inch rods with set-screw form clamps at the top and bottom, making it possible to adjust the slope of the

chute to secure the best rate of flow for the concrete, depending on the position of the paver.

Studs of 2 x 6-inch lumber were spaced along the bottom at 18-inch intervals, with wales of the same material run longitudinally and used in suspending the chute.

Overpass Design: Quantities

The overpass, which was constructed under a contract awarded by the Virginia Department of Highways, was designed by the National Park Service to carry the new connection on Va. 168 over the Colonial Parkway. It has a 28-foot roadway and two sidewalks each 2 feet 4½ inches wide. The span is 50 feet 8¾ inches, with a rise of 12 feet 5¾ inches from the spring line on a 32.10-foot radius. The retaining wall is 10 feet high on one side and 8½ feet on the other.

In placing the brick veneer for the structure, the contractor laid the brick inside the arch form with strips be-

(Concluded on next page, Col. 4)

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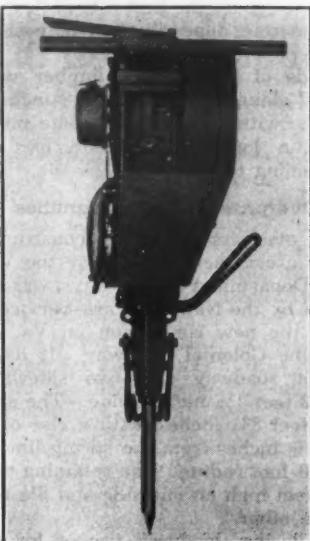
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ROETH VIBRATOR COMPANY
2 Farragut Ave., Chicago, Ill.



The latest model of the Sytron self-contained gasoline hammer has a new tool-retaining arrangement.

Tool-Retaining Feature On Hammers Improved

An improvement in the design of the tool-retaining arrangement of its self-contained portable gasoline hammer paving breakers has been announced by the Sytron Co., 227 Lexington Ave., Homer City, Pa.

As redesigned, the tool end utilizes the resiliency of a spring tool-retaining clip to eliminate the solid-latch mechanism previously employed to hold the tool in the hammer. This provides easy spring action of the tool itself when used at maximum over-travel, and a quicker, easier method of changing tools. The danger of broken retaining latches, nose castings, and other parts, because of a lack of resiliency, is eliminated, it is stated.

Additional information about Sytron gas hammer paving breakers and tools for use with them, with details as to their varied applications, may be secured from the firm on mention of this news item.

A Car Traveling People

This is the title of an illustrated 48-page booklet on the role of the automobile in American life. Just published by the Automobile Manufacturers Association, the work surveys the changes



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wrought in our way of life since 1919 as a result of the ever-increasing use of motor vehicles.

Half the communities in the nation, about 54,000, are served only by automobiles and highways, the booklet points out. Fifty-two million people in 15,000,000 cars spend \$5,000,000,000 touring the country annually. More than 360,000 establishments, such as dealers, repair shops, and gasoline stations, do an \$8,500,000,000 annual business with motor-vehicle owners.

Operating costs for automobiles have dropped 50 per cent in the period 1926-1939, the booklet states. Revenues from gas taxes and registration fees have grown from \$128,000,000 in 1921 to \$1,458,000,000 twenty years later. Federal excise taxes, personal property taxes, and tolls swell the latter figure to \$2,150,000,000, most of which has been allocated for road construction and improvement.

While highways cost the taxpayers a large annual bill, it is not generally realized "that highway improvements

tend to pay for themselves" by creating new traffic and therefore added revenue, and by increasing the value of adjacent lands, buildings, and farms, the report states. "Good highways, in other words, are considered good business."

Copies of this booklet may be obtained by writing the Automobile Manufacturers Association, 1320 New Center Bldg., Detroit 2, Mich.

Moore Joins Barber Corp.

Clark Moore, until recently Assistant Regional Deputy Director of the Small War Plants Corp., and former President of the Equitable Asphalt Maintenance Co. of Kansas City, has been named Manager of Asphalt Paving Sales for the Barber Asphalt Corp., Barber, N. J. Besides oil refinery and oil asphalt operations at Perth Amboy, the Barber firm has extensive holdings of gilsonite, a form of industrial asphalt found only in Utah, and plans to resume the importation of Trinidad asphalt.

Bridge Concreting

(Continued from preceding page)

tween the brick to give them the proper spacing. They were pointed later after the forms were stripped.

The quantities included:

Foundation excavation	1,470 cu. yds.
Class A concrete	1,170 cu. yds.
Class B concrete	175 cu. yds.
Reinforcing steel	161,300 lbs.
Brick masonry	221 cu. yds.
Stone or gravel sheathing	210 cu. yds.
Treated-timber piling for footing foundation	15,300 lin. ft.
Membrane waterproofing with asphalt-plane protection	415 sq. yds.
Damp-proofing	225 sq. yds.
8-6-8-inch reinforced-concrete pavement (including removal of pavement in place)	267 sq. yds.
8-4-8-inch reinforced-concrete pavement	263 sq. yds.

Personnel

The contract for the construction of this overpass was awarded by the Virginia Department of Highways, General J. A. Anderson, Commissioner, to B. W. Jackson of Richmond, Va., for whom A. S. Penny was Superintendent. For the Highway Department W. R. McFall was Resident Inspector.



AT Nairobi, British East Africa, at Walla Walla, Washington, and more than 300 cities in between, owners of Hyster Tractor Equipment get quick and efficient service through "Caterpillar" distributors and dealers.

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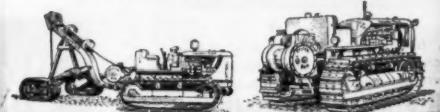
you have the assurance of friendly, intelligent cooperation on service as well as sales from men who know—"Caterpillar" distributors and dealers all over the world.



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A 20-Year Program Of County Road Work

Bond Issue of \$1,000,000 Has Just Been Paid Off; Best Roads Now in State System; Needed Work

By L. VARNER STINSON, County Engineer, Bryan County, Oklahoma

IN order to get a clear picture of what Bryan County, Okla., has accomplished in the construction of permanent and semi-permanent roads, it is necessary to review the program for the past twenty years. In 1922, Bryan County voted to issue road and bridge bonds in the amount of \$1,000,000 to construct hard-surfaced roads and permanent bridges. With this sum, a total of 145 miles of gravel-topped roads, with bridges and culverts of concrete and steel, was completed. All of these roads were taken over later by the Oklahoma State Highway Commission and incorporated into the state highway system. It has been only within the past year, however, that the taxpayers have liquidated the last of this bonded indebtedness.

The greatest progress that has been made towards permanent road construction in Bryan County in recent years was during the CWA and WPA public works programs. In spite of inefficient and unskilled workmen, a lot was accomplished in the way of graded and hard-surfaced roads, and more particularly in the construction of permanent bridges and culverts. At the peak of the WPA program, there were 2,700 men and women on relief projects in the county, and about 85 per cent of these were engaged in county road work.

The present mileage and types of roads in the county system are:

Gravel-surfaced roads and permanent drainage structures	86.92 miles
Graded roads without surfacing, but with permanent concrete and steel drainage structures	155.90 miles
Black-top-surface roads with permanent drainage structures	12.20 miles
Concrete roads with permanent drainage structures	3.70 miles
Unimproved roads	377.10 miles
Total	635.82 miles

In addition to this mileage on the county highway system, there are 1,366 miles of unimproved community roads with wood drainage structures.

County Finances

The state law provides that the ad valorem tax shall not exceed 15 mills, and with reduced valuation all of this is consumed in the general operation of the county government, including schools, old-age pensions, and officers' salaries. This leaves as the only funds available for all road and bridge purposes those known as "cash funds". These are derived from the 5-cent state tax on gasoline sold in the county, which is collected by the State and a portion returned to the County to be used on county roads and on streets in first-class cities. Motor-vehicle license funds are distributed in a similar manner. There is also a small gross production tax on producing oil wells. With

no new cars, and restrictions on the amount of gasoline consumed during recent years, county funds dwindled to the small sum of about \$33,000 for maintaining and repairing all roads. This completely eliminated new road construction.

Road Maintenance

The normal maintenance organization in Bryan County comprises three road supervisors, one in each district, and fifteen men working with each supervisor. Prior to the war, the equipment for each district consisted of two or three crawler tractors of 30 to 60 hp; two patrol graders with 10 to 12-foot blades, depending on the size of the tractors; one or two rotary fenders; and an ample supply of small equipment

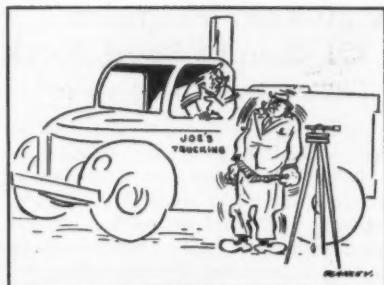
such as slips, shovels, picks, etc.

War conditions reduced the available and usable equipment to seven tractors and blades for the entire county, two patrol machines, and a very small amount of hand tools. Similarly, the labor situation was also very bad.

The County owns no garages for the maintenance of equipment. Minor repairs are done by the operator of each piece of equipment with the aid of one general "trouble shooter" and overseer for the entire county.

Post-War Plans

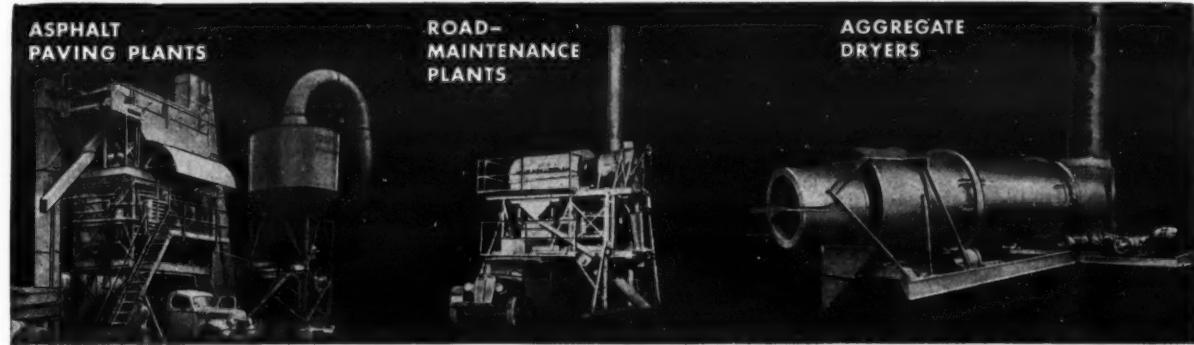
A post-war program of road projects has been set up by Bryan County. A map has been prepared showing the roads, with descriptions and the justification of each proposed project. The proposed Federal-Aid system, consisting of 276 miles, as approved by the Board of County Commissioners, has been submitted to and approved by the State Highway Department to be transmitted to the Public Roads Administration.



"Do you mean that you actually suspect one of US of being the criminally care-less fiend that ran down your defense-less grade stakes?"

It is hoped to get surveys, plans, and estimates started in the very near future, as soon as the system has been approved by the PRA. Then it is expected that contracts will be let and construction will be under way next summer. This road work will be done in accordance with Oklahoma House Bill No. 470 and the Federal-Aid sec-

(Concluded on next page)



Record Breaking! MADSEN EQUIPMENT

BITUMINOUS MIXING PLANTS
BATCH CAPACITIES—500 to 6000 lbs.
RECORD (3000-lb. Plant)—2414 tons in 12 hours reported by Lewis Construction Co., on the Marine Base at El Toro, Calif.

BITUMINOUS MIXING PLANTS
BATCH CAPACITIES—500 and 1000 lbs.
MIXING SPEED—40-second cycle.
FEATURES—Jack Erection; Unit-Power Transmission; Asphalt Pressure-Injection.

COUNTER-FLOW TYPE DRYERS
SIZES—32- to 72-in. diam. All lengths.
FEATURES—Unit-Power Transmission; Flexible Ring-Sprocket Drive; Oversize Tires and Trunnions; All-Welded Shell.

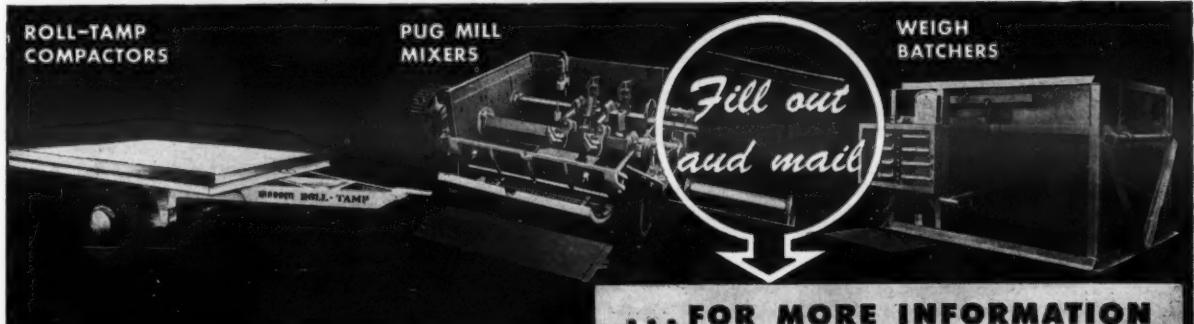


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FOR OIL-MIX, SOIL CEMENT & BASE CAPACITY per hour—200 to 550 tons.
REPORTED by Phoenix Construction Co. 7920 tons in 20 hrs. to Calif. specifications.
METERED OIL—In ratio to travel speed.

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WIDTHS—convertible from 10 to 18 feet.
SPEED—3065 linear feet by Roy Houck, Oregon. Consistently finishes pavement to .05 inch, or less, variation in 10 feet.

TRUCK LOADING BATCHERS, ALSO
Proportioner Plants; 1- to 6-unit Bins and Bunkers; Screening Plants; Central Mixing Plants; other batcher equipment.
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For 68 Years Builders of Fine WHEEL BARROWS:
AMERICAN STEEL SCRAPER CO.
Sidney, Ohio
Watch for Post-War Models

Rubber-tired rollers have dual wheels with oscillating axle on walking beam. It kneads the soil as it compacts.
MADSEN IRON WORKS
HUNTINGTON PARK, CALIFORNIA

A 20-Year Program Of County Road Work

(Continued from preceding page)

ondary program as provided for in the Federal-Aid Highway Act of 1944.

No work in this section of the country is more important than this proposed highway work, and we are looking forward with great hopes and enthusiasm to the time when the program will actually get under way.

County Industry

Bryan County is located in the southeastern part of the state of Oklahoma bordering on the Red River on the south. It contains 928 square miles and has a population of around 40,000. Durant, the county seat, has a population of over 10,000.

The chief industry is agriculture and live-stock raising, with two large nurseries where pecans, magnolia, and all kinds of yard shrubs, fruit trees, and berry bushes are raised and shipped to

the surrounding states. The chief topographical features are those of a rolling prairie country, with some timbered and hilly sections along the streams. The terrain is comparatively level, but not flat, with ample drainage.

County Organization

For purposes of administration, the county is divided into three commissioner districts, with the Commissioners elected at the general election in November for terms of two years, but they do not take office until the first Monday in the following July, which is the beginning of the new fiscal year. The present Board of Commissioners, installed July 2, 1945, are: D. M. Etheridge, District 1; Pate Williams, District 2; and Jack Caldwell, District 3.

The County Engineer is appointed by the Board of County Commissioners for a term not to exceed that of the Board making the appointment. The author has served as County Engineer since the office was created by statute in 1915, and previously to that as County Surveyor

and Acting County Engineer continuously since Oklahoma became a state in 1907. He has been in responsible charge of all permanent road and bridge work, making plans and surveys, and supervising construction.

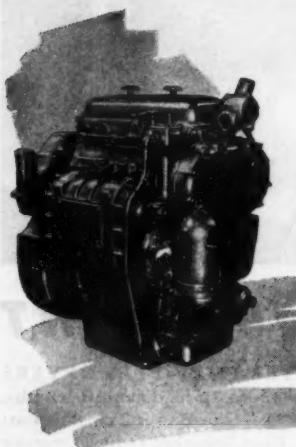
It has been the custom for each Commissioner to supervise the road and bridge work in his own district and usually he also acts as purchasing agent for all road equipment and supplies. The County Engineer is responsible only for those phases of work which require engineering ability.

The author is a senior member of the American Association of Engineers and of the State Society of Professional Engineers.

Kinney Mississippi Agent

The appointment of W. W. Dunn & Co., Jackson, Miss., as its representative in that state has been announced by the Kinney Mfg. Co., Boston, Mass., maker of bituminous distributors, asphalt pumps, and allied equipment.

Hard working hand that keeps on the job



How hard a tractor can work, and how long, rests largely with its engine. Drawbar pull is heavy. Strains are great. And the job must go on day in and day out.

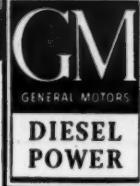
It's right here that General Motors Series 71 Diesels shine. Both in peace and at war they have built rare records of performance. Already many of them in tractors have delivered up to 25,000 hours of economical performance and are still going strong.

Farmers and construction engineers like them especially because they deliver great power with less than usual size and weight. They start fast and are easy to service.

And replacements when needed are readily available because of GM simplified design and because elimination of different sizes of parallel parts increases the availability to owners of the right part when it is needed.

The successful example of GM Diesel power in tractors indicates its value in other products such as lumber carriers, "special" trucks—in all forms of marine power requirements—in all forms of contractors' and road machinery—in welders—in mining and pumping—in any tough industrial job.

During five years on the Arena-Norton farm, largest vegetable shippers in Arizona, an Allis-Chalmers tractor like this, powered by a GM Diesel, has operated 18,186 hours, day in and day out. This 3,200-acre farm now employs four of these tractors.



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BUY BONDS**

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Mountains Leveled In Grading Airport

9,000,000 Cubic Yards of Excavation Is Major Item in Creating 743-Acre Port At Charleston, W. Va.

By WILLIAM H. QUIRK,
Eastern Field Editor

SOMETIME near the end of next summer when the last shovelful of earth is placed, one of the greatest grading jobs in the country, involving 9,000,000 cubic yards of excavation, will be finished on the Kanawha Airport at Charleston, W. Va. Located on top of what is known locally as Coonskin Ridge on very rugged terrain in a state essentially mountainous, the airport is being constructed with material obtained by leveling the tops of four mountains, and filling in the deep adjoining valleys to form a large plateau on which three long runways are laid out.

The first stage in the five-point program outlined by the Kanawha County Court, sponsor of the project, is now nearing completion as the Harrison Construction Co. of Pittsburgh, Pa., contractor for the airport, has moved the bulk of the 5,221,656 yards of unclassified excavation, part of the original contract on which work was started in October, 1944. Proceeding concurrently, the same contractor is also constructing a third runway, besides lengthening the first two, in the second stage of development which involves an additional 4,000,000 yards of excavation. County funds ran out after the first stage of the work was financed, and the rest of the grading is being done with Federal money obtained by a special appropriation in May, 1945.

When completed, the new airport, which lies less than 3 miles air-line distance from Charleston, capital of the Mountain State, will have three runways, the longest of which, No. 1, will measure 6,200 x 500 feet, and will be paved 150 feet wide for a length of 6,000 feet. Almost at right angles to this is runway 2, which will be 5,200 x 500 feet, with 5,000 x 150 feet of paving. Runway 3, between runways 2 and 1, like the horizontal bar in the letter A, will probably be used for instrument landings and therefore will be paved 200 feet wide for a length of 5,500 feet on a landing strip 500 feet wide x 5,700 feet long. Runway paving will consist of a 24-inch dry-bound native-stone base and a 2-inch surface of asphaltic concrete; the depth of the base course will be increased to 30 inches under the last 400 feet of each runway and under all taxiways, where greater strength is needed because of the vibration of planes warming up and turning around.

Alternate layers of hard and soft material in the sandstone hills caused the excavation item to be set up as unclassified, and also permit the use of practically all types of earth-moving equipment, the rock being first blasted out and then loaded by shovels into trucks and rubber-tired wagons, while the shale and earth are moved by tractor-drawn and self-powered scrapers. About 40 per cent of the total material is being moved by shovels and trucks, while the remaining 60 per cent is moved by tractors and scrapers.

The highest fill is on runway 1, where the difference in elevation between the original ground at the toe of the slope and the finished center grade is 209 feet; the maximum height of this fill at the center line is 135 feet. The maximum depth of excavation is 125 feet, which means that sometimes material has to be moved downward a vertical distance of more than 300 feet to the bottom of

the fills in a comparatively short horizontal distance, necessitating the use of extremely steep haul roads which in the beginning had grades as high as 35 per cent.

Nearly half the excavation item in the original contract, or over 2,000,000 yards, was needed for 1,600 feet of fill on runway 1. From one big cut at the intersection of runways 1 and 2 about 1,500,000 yards was leveled off, providing material for the adjoining fills. Enough material for the construction of the airport is available right at the site, and there is no problem of disposal as surplus earth in any location is wasted over the sides of the fill.

Most of the rock is blasted out by drilling horizontally into the softer strata of the hills for the insertion of

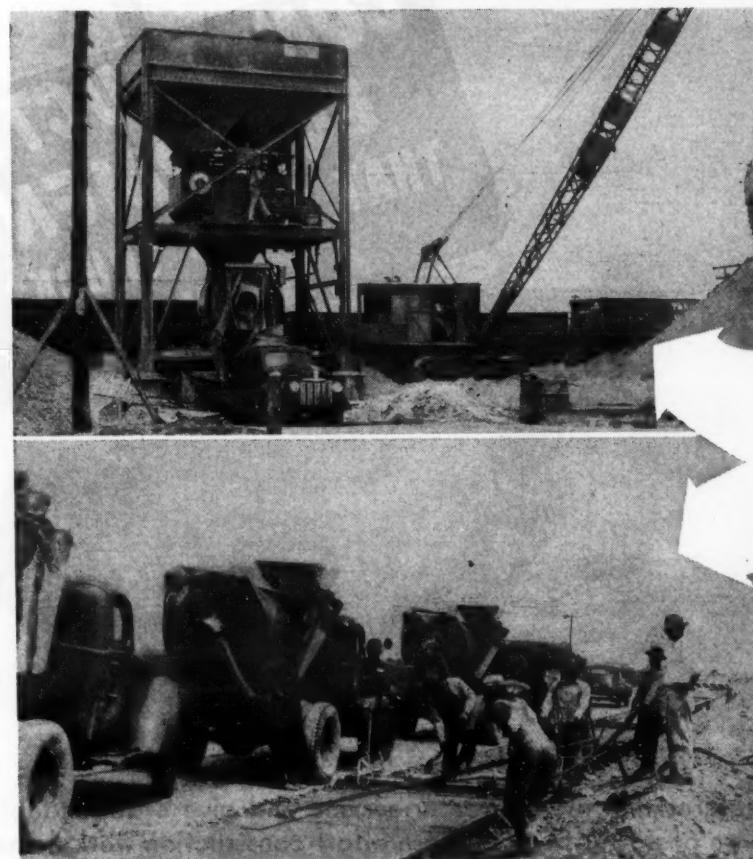


C. & E. M. Photo
On drilling rock preparatory to blasting at Kanawha Airport, Harrison Construction Co. used a Hardsoeg horizontal drill with automatic power feed.

the dynamite, which explodes with a lifting action, producing far better results than if the holes were drilled

vertically. If the upper crust were solid rock, this method would not be so good.
(Continued on next page)

"With Gulf Quality Lubricants and Fuels we get better performance from equipment, lower maintenance costs"



says Superintendent
Ed Strickler

*R. P. Farnsworth & Company, Inc., Houston, Texas, have the contract to widen over 20 miles of U. S. Highway 290 between Eureka and Cypress, Harris County, Texas. This contractor has used Gulf quality lubricants and fuels exclusively for over 15 years.

"I AM PARTIAL TO GULF PRODUCTS because they help me get maximum performance from every piece of equipment—the kind of performance that's needed to meet finish dates on our contracts," says Superintendent Ed Strickler of R. P. Farnsworth & Company, Inc.* "With Gulf lubricants and fuels we get good gas mileage and very low maintenance costs. Besides, I can always depend on the prompt delivery of every Gulf order."

During the past few years, there has been little allowance in contracts for breakdowns and delays due to mechanical troubles. That's why leading contractors have formed the habit of using Gulf quality lubricants and fuels as basic job insurance.

They know that Gulf products help effectively to keep equipment on the job—and maintenance

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Rough terrain and plenty of rock characterize the Kanawha Airport job near Charleston, W. Va.

Grading Airport

(Continued from preceding page)

ductive, but the alternate layers of blue shale yield to the bite of the horizontal drills which are not used on the solid sandstone.

Blasting Methods

Using 5-inch-diameter bits, the horizontal holes are drilled by a Hardsoc and a Parmanco power drill. The former is equipped with an automatic power feed which exerts constant pressure on the bit and requires only three men for its operation. It produced such a good record of speedy drilling that the contractor had his mechanics install a similar hydraulic feed on the Parmanco unit, eliminating hand pressure and the use of one or two men. Using 6-foot bit lengths, the drills have a capacity of 50 feet, and usually work close to this maximum, with the average length of holes being 45 to 48 feet. The holes are drilled into the face of the rock at the same level, from 10 to 15 feet apart, depending upon the height of rock above the holes. From 7 to 15 holes are blasted at one time, breaking up from 25 to 35 feet of shale and rock overhead.

Into each hole is inserted 300 pounds of Atlas 40 per cent dynamite on an average, made up of 4½-inch-diameter x 16-inch-long sticks weighing either 12½ or 16 2/3 pounds. The final 15 to 20 feet of drill hole is plugged with sand-filled paper containers the same size as the dynamite sticks. Two exploders are put in each hole, attached to the next to the last stick of dynamite or about 20 feet inside the hole. The wires are then connected on the outside and hooked up to the blasting machine which is set up about 500 feet away, with a shovel or truck nearby to shelter the blaster should any rock break out and fly that far. Detonations take place one-half hour after work has ceased for the day when all workers and rolling equipment have moved from the danger zone. A four-man crew, short-handed because of the lack of such skilled labor, does the dynamiting.

When isolated patches of rock are encountered in moving dirt or shale, or when rock alone is being excavated for use in the base course, and the presence of earth is objectionable, wagon drills are used for vertical holes. Four Gardner-Denvers are used with maximum 14-foot lengths of 1½-inch steel, starting with 6-foot lengths, going to 12 feet, and finally reaching 14 feet, with bits from 2 to 1½-inch diameter. The holes are drilled on about 4-foot centers and charged with an average of eight sticks of Atlas 40 per cent dynamite, 1½ x 10-inch size, while the rest of the hole is filled with loose sand and tamped.

Also engaged on this work are eight Gardner-Denver 55-pound jackham-

mers which, with the wagon drills, are powered by two Gardner-Denver 365-cfm and one Chicago Pneumatic 105-cfm air compressor. The horizontal power drills, however, require no compressors and are moved about quickly from one location to another as the occasion requires.

Benching Required

Before any filling operations began, the steep side slopes were benched to prevent slides later. Two benches, one above the other, were dug into the original slope at the foot of where the new fill was to be placed, and filled with rock to act as a retaining wall at the toe of the slope. These two benches are 40 feet wide, and above them was cut a series of smaller benches up the slope, decreasing in width down to about 15 feet. The benches have an inward pitch of 1 on 10 and are from 50 to 200 feet long, according to the topography.

Rock was placed first in the benches and on the bottom of the embankments.

(Continued on next page)

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Gas-Engine
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**CONSTRUCTION
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THAT KEEPS TRUCKS ON
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Features that mean greater service and give a dependable reserve of power for that extra effort construction work demands, are built into the Anthony line . . . Anthony "Super" Hydraulic Hoists and Dump Bodies, 5 to 30 tons, for conventional and C.O.E. trucks, 6 wheelers and semi-trailers . . . Anthony Hydraulic Lift Gates to speed up loading and moving of equipment and materials . . . Anthony all steel Material Spreaders cut road building and maintenance costs. Ask your truck dealer to show you the Anthony features that keep trucks on the job.



Manufactured by ANTHONY CO. Streator, Illinois



Grading Airport

(Continued from preceding page)

This gives the fills greater stability, with better drainage along the original ground slope being assured through a broken rock section than would be provided by compacted earth. On the outside and top of the fills dirt and shale is placed and compacted.

Seven shovels, two Northwest 80D $\frac{1}{2}$ -yard, one Lorain 82 2-yard, and four Lorain 80 $\frac{1}{4}$ -yard, were used to dig the benches, and excavate the rock and mixed material for loading the trucks and trailers. Working with the shovels in the big rock cuts are four Lorain 40 cranes, two with 30-foot, one with a 35-foot, and one with a 45-foot boom, to which are attached three 1,000-pound and one 4,000-pound steel weights respectively. By dropping the weights on the larger stones loosened by the blasting, and cracking them in pieces small enough to be handled by the shovels, practically all secondary blasting is eliminated and no time is lost through stoppage. One of the lighter units is mounted on a truck for greater mobility.

Earth Moving

A great fleet of assorted equipment was assembled to move the mixed material. Working with the shovels are three Maxi 15-yard side-dump trucks which usually carry a heaped load of 25 yards. These units are new in the east, being manufactured in California; have four dual wheels in the back, with ten tires altogether; and are powered by Cummins diesel engines for an average speed of 10 to 12 mph. Also carrying the output from the shovels are eighteen end-dump Euclids of 9.7 to 12-yard capacity moving between 12 and 15 mph; six bottom-dump DW-10 Caterpillar wagons of 8 $\frac{1}{3}$ -yard capacity each, operating at about 15 mph; and six Super C Tournapulls, four having 10-yard slide bottom-dump wagons, and two with 11.5-yard wagons of the same type, operating at an average speed of 15 mph. The speeds quoted are only for level runs which are few and far between, considering the hilly nature of the terrain.

Three LeTourneau heavy-duty Rooters loosen up the shale where the scrapers are working. Material other than rock is moved by two 16-yard Super C Tournapulls, and a fleet of twenty-nine LeTourneau scrapers each pulled by a Caterpillar D8 tractor. Of this group seventeen are 12-yard size, one is 15-yard, one is 18-yard, seven are 22-yard, and three are 25-yard. Eight other D8 tractors are used either as pushers in loading, as replacements when a unit is being greased or repaired, or for leveling the fills. The scrapers move at 3 to 5 mph.

Four Caterpillar power graders, two No. 12's, one No. 112, and one No. 212, keep the haul roads in shape under this great volume of heavy equipment. The lighter tractor-drawn scrapers were selected to negotiate the steepest grades of 35 per cent, with the heavier scrapers working the less steep haul roads, and



C. & E. M. Photo
Among the dirt-moving fleet at Kanawha Airport are three 15-yard side-dump Maxi trucks which usually carry a heaped load of 25 yards.

the rubber-tired equipment kept if possible to grades between 15 and 25 per cent. The direction of loaded hauls is downhill, and with the close attention given to the working limits of the dif-

ferent equipment no trouble has been met with units being unable to get back up the hills.

The tractor-drawn scrapers are kept to hauling distances of less than 1,000

feet, while the rubber-tired self-powered equipment makes trips averaging 1,500 to 2,000 feet one way; the overall average haul on the job for all types of earth-mover is around 1,200 feet. The average total number of yards moved in a 10-hour day over the entire job has been 18,000 to 20,000. The contractor had been working only one shift a day for a 6-day week, due to the manpower shortage. However, he has been able to add a night shift of three shovels, which is producing approximately 3,500 yards in 10 hours. Twelve light plants, mostly 5-kw, furnish light for the night work. The average per day under this arrangement is approximately 24,000 cubic yards. In September, a total of 600,000 cubic yards was moved.

To take care of the large amount of equipment on this job, the contractor set up repair shops which are described on page 61 of this issue.

Long-Distance Pumping

To lay the dust on the haul roads and
(Continued on next page)

2 for 1 Performance

HARD-FACED WITH STOODY SELF-HARDENING



THOSE power shovel track pads, rollers, sprockets, idlers and bucket parts need not put you down for repairs or run overhead costs out of proportion if they're wear-protected with Stooody Self-Hardening. For here's a hard-facing alloy that stays on despite the toughest going under all operating conditions.

Stooody Self-Hardening at least doubles life of manganese steel parts, lowers overhead and raises production because downtime is minimized. Made in coated and bare rods for either oxy-acetylene or D.C. electric application and convenient to buy because stocks are maintained in over 600 warehouses throughout the United States.

TWO FOR ONE performance is yours for the welding! Try Stooody Self-Hardening on your next overhaul. 100 lbs. ordered today from your nearest distributor will keep equipment in operation, cut expenses, increase your output!

STOOODY SELF-HARDENING ADVANTAGES SUMMARIZED:

- **LOW COST.** 50c per lb.—only a few cents difference between manganese rods.
- **HIGH WEAR RESISTANCE.** Twice that of manganese rods.
- **HIGH IMPACT VALUES.** Won't chip or spall under average operating conditions.
- **EASY APPLICATION.** Bonds firmly to manganese.
- **THICK DEPOSITS.** Up to $\frac{3}{8}$ " thick with $\frac{1}{4}$ " Bare Electric Stooody Self-Hardening.
- **NO SCALING.** Full depth at one pass; eliminates tiresome scaling operations.

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STOOODY HARD-FACING ALLOYS

Retard Wear



Save Repair

Grading Airport

(Continued from preceding page)

runways where equipment is working, thereby preventing collisions from poor visibility, five 2,000-gallon sprinkler trucks, Fords, Sterlings, and Macks, keep the ground watered as needed. Getting water to the airport presented a problem. From a Charleston city water main running through the valley below the airport, a line was tapped to bring water about half way up the hill to a 2,000-gallon tank. This reservoir tank is located at the highest point to which the city pressure can force the water. From here the water is pumped the remaining distance against an approximate head of 150 feet by a Gorman-Rupp K100 triplex electric pump, through about 2,500 feet of 3-inch pipe, to a 5,000-gallon water tank at the edge of the airport.

Whenever this tank gets low on water, an automatic switch starts the pump on the hillside, and the storage tank, which is mounted on a wooden trestle, is refilled. The sprinkling trucks pull alongside this tank and are filled by gravity flow. Three or four other water tanks from 500 to 2,000-gallon capacity are scattered around the field for the convenience of the sprinklers, and to furnish water for the radiators of the trucks and tractors.

Diesel fuel oil for the equipment also has to be pumped from the Elk Refining Co. plant, located in the valley along the east bank of the Elk River, through 4,000 feet of 1½-inch pipe line with a vertical rise of around 325 feet to two 2,000-gallon storage tanks at the airport. The line follows the path of an access road built by the contractor into the side of the hill so that he could get his equipment to the job site. When these tanks get low, the refinery is called and more fuel is pumped.

Placing Material

The rock going into the fill is kept back at least 20 feet from the edge and leveled off with D8 tractors so that the layers are not over 2 feet thick, and then rolled by three Buffalo-Springfield three-wheel rollers, two 10-ton and one 12-ton. The earth, shale, or other friable material is placed in successive layers of not more than 8-inch loose depth, and rolled by six double-drum sheepfoot rollers, five LaPlant-Chote and one LeTourneau, pulled by four D7 and two D8 Caterpillar tractors. This material is then given additional rolling by the steel-wheel rollers. The openings between the rocks in the fill are choked with earth to fill any voids remaining after the dozers get



C. & E. M. Photo

R. W. Smith, subcontractor for 40,000 yards of crushed stone for runway base at Kanawha Airport, processed rock from the cuts at his plant.

through mixing the rock and earth. One of the crane stone breakers operates where the rock is being placed to reduce any large pieces reaching the fill.

The fill slopes are 3 on 1 leading up to the crown and the landing strips,

which have profile grades of 1 per cent on runways 1 and 2, and 1.35 per cent on runway 3. The center line of the 50-foot taxiways will be 275 feet from the center line of the landing strip. The pavement will have a 1 per cent slope from the center to the edge be-

neath which will run a tile underdrain on each side.

This tile is placed in a trench 2 feet wide x 3 feet deep, and backfilled with stone graded from 1 inch to 4 inches in maximum dimension. At about 250-foot intervals inlets are placed from which laterals lead off to the edge of the fill and connect to reinforced-concrete pipe. This pipe is laid below the surface of the slopes after the grading is finished, and runs down to headwalls at the toe where stilling basins are to be built. Around the edges of the embankments 3½-foot paved gutters of 4-inch asphaltic concrete are built with an earth dike on the outside to prevent water from washing down and eroding the slopes.

Producing Base Stone

For the base course on the three runways, about 360,000 cubic yards of native stone is necessary. As a starter the Harrison Construction Co. let a contract to R. W. Smith of Charleston, W. Va., to

(Continued on next page)

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*are made for
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Dependable day-in and day-out performance has made Euclids the favorite off-the-highway hauling equipment for the toughest mining and construction jobs. Simple, rugged construction combined with large capacity and ample power and speed results in lower hauling costs for any material and any length of haul.

Here are a few of the Euclid features that are helping to keep hauling costs down for hundreds of contractor and industrial owners: designed and built expressly for heavy duty off-the-highway service ... powerful and efficient full floating drive axle of double reduction planetary type with full rear axle load carried on tapered roller bearings ... large capacity, 15 to 32 ton payloads ... top speeds of 21.8 to 34.4 m.p.h. ... wide range of usefulness — efficient for handling all types of material on any haul.

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Grading Airport

(Continued from preceding page)

Supply 40,000 yards of crushed stone taken from the rock cuts at the airport. Harrison delivers the rock to the crusher and hauls the finished product away to a stockpile, while Smith does the processing. Smith set up his own crushing plant close to the intersection of runways 1 and 2, within about 900 feet of where the native sandstone was being taken out by two wagon drills, blasting, and a Lorain shovel. Any large pieces are broken up further by one of the weights working from the boom of the crane. Two of the Euclids haul material to and from the crusher.

From the top of an earth ramp the trucks dump stone directly into a 45-ton hopper made of oak 4 x 4's and lined with steel plates, at the bottom of which is a steel-plate feeder made from the tracks of a Caterpillar D8 tractor. The feeder advances the stone to an Austin-Western 21 x 38-inch roller-bearing jaw crusher, from where it is raised by a Barber-Greene 30-inch x 100-foot conveyor to a Telsmith Pulsator 4 x 8-foot triple-deck vibrating screen. From top to bottom the screen sizes are 3½, ¾, and ⅜-inch.

Oversize stone that the largest screen will not admit is chuted down an incline to a Telsmith Gyrasphere crusher where it is broken up further. From here it goes up a 20-inch x 60-foot return conveyor, and is dropped off on the lower end of the first long conveyor which brings it back to the screen for another trial. After passing the screen, the material is collected in a Cedarapids 100-ton bin, and later weighed on a dial scale in a 2½-ton weigh bucket before being dumped into a Euclid for hauling to the nearby stockpile.

Two sizes of stone are obtained with this screening system, the larger size, graded uniformly from about 3 down to ¾-inch, being used for the dry-bound native-stone base course, and the finer material, graded from ¾-inch down to dust, used as a choke or filler course on top of the dry-bound base. The plant is operated by two Caterpillar D13000 diesel engines, one driving the feeder, the jaw crusher, and the two conveyors, while the other engine runs the Gyrasphere crusher and the Pulsator screen. At the beginning of crusher operations the plant had a capacity of 700 tons per 10-hour day which was later stepped up to 100 tons an hour.

When a second contract is let for the crushing of an additional 320,000 yards of stone for the completion of the base course, another quarry is expected to be opened and new facilities set up for crushing 300 tons of rock per hour. The blue and gray sandstone taken from the airport was found after tests to have a wearing quality of 30 at 500 revolutions, a crushing strength from 7,000 to 10,500 pounds, and weighs about 4,252 pounds to the cubic yard.

Major Items

The major items in the first contract which was awarded by the Kanawha County Court to the Harrison Construction Co., Pittsburgh, Pa., on its bid



Three of the men responsible for the construction of the Kanawha Airport are (in usual order) L. S. Westcott, Chief Field Engineer for Harrison Construction Co.; E. Trussell, Project Superintendent; and Herman Snyder, Office Manager for Harrison.

of \$2,547,829.60, lowest of nine bidders, are as follows:

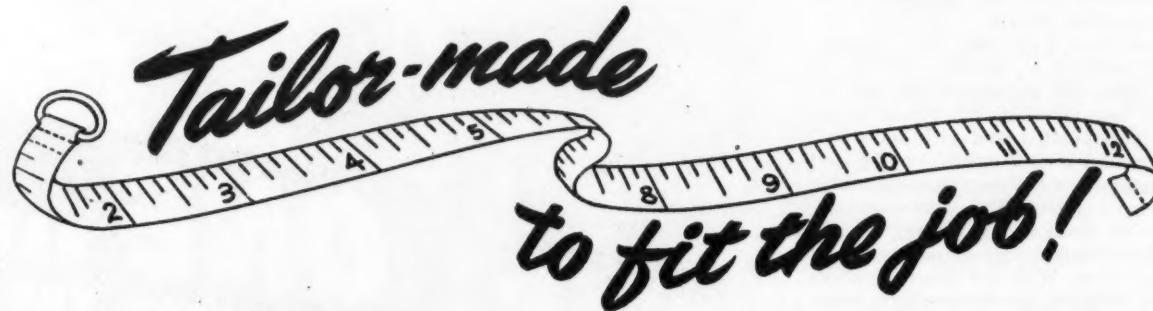
Unclassified excavation	5,221,656 cu. yds.
Reinforced-concrete culvert pipe, 15 to 30-inch	3,376 lin. ft.
Corrugated-metal pipe, 15 to 24-inch	5,556 lin. ft.
Tile underdrain, 6 and 8-inch	3,300 lin. ft.

This contract includes the construction of runways 1 and 2 to lengths of 4,500 feet and 4,200 feet respectively. The second contract, being handled by the same firm, lengthens these runways to 6,200 and 5,200 feet respectively, and

provides for the building of runway 3 to 5,500 feet. The major item in this contract, besides the clearing of about 40 acres, is 4,000,000 yards of unclassified excavation, with the contract price being \$1,806,000. On this second phase of the work the unit price on excavation is 45 cents a yard, as compared with 47½ cents on the first contract.

Funds for the first contract on Kanawha Airport were provided by a \$3,000,000 bond issue approved by the voters of Kanawha County in November, 1943, with the County furnishing sufficient money from its general funds for the purchase of the 743-acre site. In May, 1945, a special appropriation of the Federal government granting \$2,750,000 for the further development of the field was made available, enabling the second phase of the work to proceed concurrently with the first contract. The total cost of the airport, including lighting and the construction of an administration building and two hangars, will be around \$6,000,000. The Civil Aero-

(Concluded on next page)



TYPES

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A medium weight bucket, classified as a general purpose bucket.

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A heavy duty bucket for moving shale or any hard formation.

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Grading Airport

(Continued from preceding page)

nautics Administration will design and supervise the construction of the runway paving, drainage, and lighting installations.

Airport History

Charleston had an airport at Wertz Field 12 miles west of the city on the north bank of the Kanawha River, but this site in the valley was unsuitable for the development of more than one runway of adequate length and with proper clearances in the required approach trapezoids. Fogs and mists common to the valley frequently suspended flights, and in 1942 the site was abandoned as an airport. The City of Charleston in the meantime had been studying the construction of another airport while Kanawha County was interested in building a hospital. The two units of government decided to exchange projects so the County took over the problem of a new airport.

More than fifty sites were investigated within a 30-mile radius of Charleston, and the present site was selected because of its proximity to the heavily populated and rich industrial area around West Virginia's capital, and its possibilities for development into a large air terminal. The elevation at the center of the Kanawha Airport is 950, which is 350 feet higher than the river valley below. With the usual thickness of fog blankets in this vicinity being around 300 feet, the airport will be free of fogs 90 per cent of the time when visibility in the valley is zero. As a southwest wind prevails 60 per cent of the time, runway 1, longest of the three, was built in this general direction.

The State Road Commission is now building to the airport a 1-mile access road which connects to the Ruffner Hollow road east of the field. The distance by highway from the Charleston Post Office to the administration area by this route is about 4½ miles. Another possible route is by way of U. S. 119 to a point opposite and across the Elk River from the airport site. Access to the airport by this route requires the construction of a highway bridge over the Elk River and about a mile of road up the mountainside. This route is also 4½ miles long and may be constructed at a later date if sufficient traffic warrants it.

Personnel

A peak force of 230 is employed on this project, the grading of which is expected to be completed by August, 1946. Present plans call for paving operations to start on runway 1 about May, 1946, followed by the paving of the other two runways, with the airport in operation by the end of September.

Fred Alley, Director of Airport Section, was in charge of the preliminary reconnaissance, design, and planning and is supervising the construction of the airport for the Kanawha County Court, made up of Mont L. Cavender, President, and Commissioners Carl C. Calvert, and J. G. Carper. A master plan for the development of the Kanawha Airport was drawn up by Whitman, Requardt and Associates, Engineers of Baltimore, Md., for whom Joseph J. Donahue is Resident Engineer. For the Airways Engineering Branch, CAA, First Region, New York, of which R. M. Brown is Chief, W. B. Hawkins is Resident Engineer. Representing the Harrison Construction Co. of Pittsburgh are M. W. Wise, General Superintendent; R. Truzzie, Project Superintendent; H. Snyder, Office Manager; L. S. Westcott, Chief Field Engineer; and F. D. Baker, Field Engineer. The stone crushing contract is being handled by R. W. Smith of Charleston, W. Va.



Photo by Westcott

One of the many hard-surfaced roads built at Oak Ridge, Tenn. The construction, repair, and maintenance of these roads is handled by Roane-Anderson, subsidiary of Turner Construction Co., New York City.

Maintaining Roads At Atomic-Bomb Plant

There are more than 300 miles of streets and roads within the 59,000-acre government reservation near Knox-

ville, Tenn., which served as a center in the manufacture of the atomic bomb. These roads transport workers and supplies and carry as well the normal volume of traffic of Oak Ridge, residential area in the reservation, which is a city

of 75,000 population.

At present, 83 per cent of the mileage in Oak Ridge and the reservation is maintained and repaired by the Turner Construction Co., New York City, operating through its wholly owned subsidiary, the Roane-Anderson Co. The firm began this work in January, 1944. The Roane-Anderson Roads and Streets Department, directed by C. C. Martin, Assistant Manager in the Division of Maintenance, constructed, reconstructed, and now maintains approximately 250 miles of roads, having turned back 50 miles in the area to the control of the counties.

When the Turner subsidiary took over, there were no hard-surface roads in the area. Between last May and the end of August, 80 miles were given a bituminous surface by the Wilson-Rogers Co., Oak Ridge, after preparation of the base by Roane-Anderson. This type of surfacing was selected because Oak Ridge produces its own stone, and bituminous material is available on short haul.



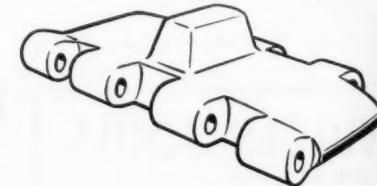
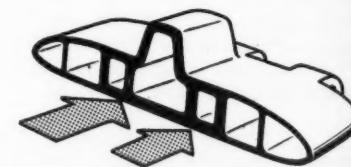
Ninety thousand pounds shovel weight plus 30,000 pounds digging load — and any one of the 66 hardened cast alloy shoes can take the whole 120,000 pounds. So strong, they'll outlast unhardened high carbon steel shoes at least three to one.

Double Thick WHERE THEY TAKE THE LOAD

Cross section shows double thick crawler roller paths, rigidly supported by double thick inside ribs. Cast, seamless, this shoe takes loads as a unit. Heat-treated alloy has basic strength, ductility to ride out shock loads, hardness to resist abrasion.

Self-Cleaning, OF COURSE! NO DIRT TRAPS

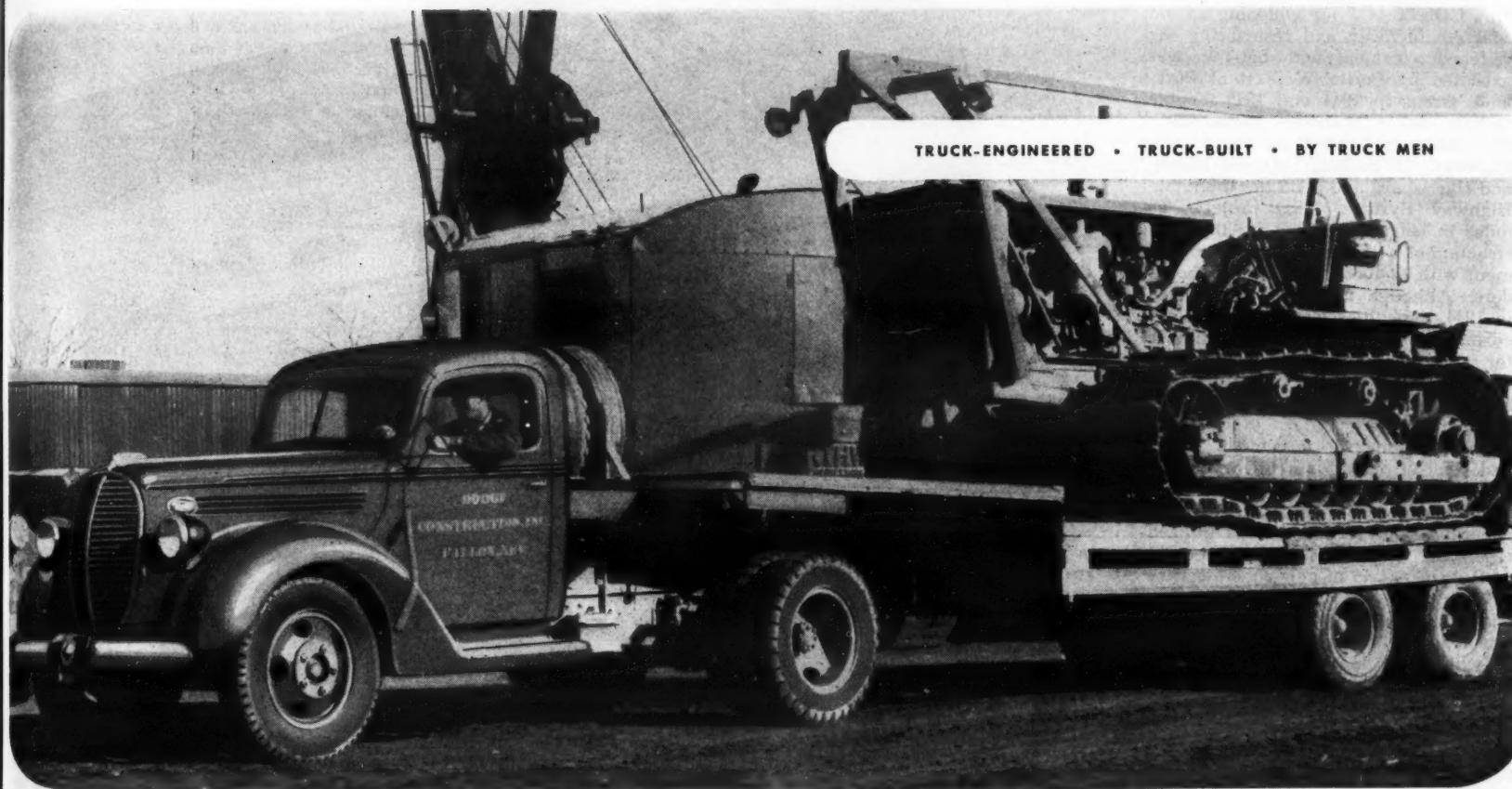
Like the shoes on Koehring equipment for 25 years, the hardened cast alloy shoes on the Koehring 605 have no dirt traps. Smoothly streamlined, they shed mud and stones and won't shower grit on the crawler belt rollers.



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into these trucks. And almost every town has a Ford Dealer who seems to feel it is his duty to exert every energy to provide the best of service. We want more and more Fords."

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FORD TRUCKS

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Old Road Improved, Paved With Hot-Mix

**Concrete Strip Added to
Pacific Highway, U. S. 99E
In Oregon; Entire 24-Foot
Width Then Resurfaced**

♦ A CONTRACT for widening an old concrete highway and resurfacing the widened pavement with hot-mix was executed by Porter W. Yett of Portland, Oreg., in 1944 and 1945 for the Oregon State Highway Commission. The job was located on the Pacific Highway, U. S. 99E, between Halsey and Harrisburg and is on the Interstate Highway System. This project, 8.9 miles in length, provided for the construction of a 24-foot bituminous pavement with 10-foot crushed-rock shoulders. Although the work was started in 1944, difficulties encountered in securing the delivery of treated timber for widening bridges on the project so delayed the work that the bituminous hot-mix surfacing was not laid until the summer of 1945.

The old concrete pavement, which had been in place for many years and had become inadequate to handle the traffic because of its 16-foot width and generally poor condition, was utilized as a base. On the west side of the old pavement, a strip of new concrete base of 7-inch uniform thickness and 8-foot width was placed, with a 4-inch-thick crushed-rock sub-base, the thickness of which was increased to 10 inches under the shoulders. The concrete for the base was placed during the early progress of the job by a Smith 27-E paver fed by trucks from a batching plant erected on the property of a commercial gravel producer near Harrisburg, with 4½ sacks of cement per cubic yard. Only one line of wood forms was set, the edge of the old concrete pavement being used in lieu of the second form.

Through the city of Halsey the pavement width was increased to 64 feet, including four 12-foot traffic lanes, two 6-foot parking lanes on each side, and a 4-foot dividing strip in the center. The traffic lanes through the city were built of portland-cement concrete, bituminous surfacing being used for the parking lanes and the dividing strip. On the highway section, a bituminous leveling course was placed 1 inch thick over the new concrete base, this thickness varying as necessary from 1 to 4 inches over the old concrete pavement. On top of the leveling course, a 2-inch wearing surface was placed in two 12-foot lanes.

To facilitate use of the highway during the construction period, the east shoulder of the road was first widened to 10 feet with 10 inches of selected-gravel base material and a ¾-inch-thick bituminous penetration surface. This widened shoulder served during the construction of the concrete base to carry the northbound traffic while

southbound traffic used the old 16-foot-wide concrete pavement.

Hot-Mix Plant

The contractor erected the hot-mix plant at the same location from which he had batched materials for the concrete base, on the property of a commercial gravel producer near Harris-

burg. The aggregate was delivered in two sizes, ¾-inch-minus and ¼-inch-minus, by trucks which dumped on top of an 87-foot timber tunnel. The material was kept trimmed by a bulldozer mounted on a Caterpillar Seventy-Five tractor. The roof of this tunnel was provided with fourteen openings made of 10 and 12-inch-diameter pipes with

sliding cut-off gates and a rather unusual type of chute to feed the conveyor belt. These chutes, 24 inches in length, were made of one-half of a 10 or 12-inch pipe with ¼ x 3-inch strap welded to their sides to increase their depth. They were suspended from the bottom of the vertical discharge pipe.

(Continued on next page)



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Nebraska

Old Road Improved, Paved With Hot-Mix

(Continued from preceding page)

by a $\frac{1}{2}$ -inch belt so placed as to balance the chutes horizontally when not in use. The discharge end of these adjustable chutes was cut off at a 45-degree angle to facilitate discharge onto the belt. At the other end, a $\frac{1}{2} \times 1$ -inch strap was welded to the bottom and extended back parallel to the conveyor belt where, by bolting to a similar strap suspended from the tunnel roof and provided with a number of bolt holes at various elevations, the angle of the chute could be changed to gage the rate of discharge onto the conveyor belt. Although fourteen gates were provided to insure uninterrupted discharge of material, usually only four were utilized at any one time, the choice being varied to secure material from different parts of the pile.

In the tunnel a 24-inch belt conveyor, driven by a 20-hp electric motor, discharged onto a shorter conveyor, driven by the same motor, which elevated the material to a 6×15 -foot job-built drier. Material from this first drier fell into a pit from which a bucket elevator raised it to a second drier, 6×21 feet in size, which was driven by the same 25-hp electric motor used to operate the first hot elevator. A second hot elevator then raised the material to the top of the bins where a 3×8 -foot Seco shaker screen separated the material into four sizes, $\frac{3}{4}$ to $\frac{1}{2}$ -inch, $\frac{1}{2}$ to $\frac{1}{4}$ -inch, $\frac{1}{4}$ -inch to No. 8, and minus No. 8, which were stored in the four compartments of the 14-yard bins. The small amount of oversize material rejected by the shaker screen went into a wooden 2-foot-square box 15 feet long suspended at the end of the bins and equipped with a sliding gate at the lower end to store the rejects in the chute until they had accumulated in sufficient quantity to warrant being hauled away by a dump truck.

The assembled asphalt plant included a 2,000-pound Madsen pugmill. Weighing was done over a five-beam Madsen scale, though only four beams were in use, a separate scale being used to weigh the liquid asphalt. In this composite asphalt plant, a $7\frac{1}{2}$ -hp electric motor was used to drive the screen, another $7\frac{1}{2}$ -hp motor drove the hot elevator, and a 50-hp motor was used on the pugmill. A 70-hp oil-fired boiler at the plant site heated asphalt, furnished atomizing steam for the drier burners, and operated the pugmill gates. Water for the boiler was obtained from a creek by a 2-inch feed-water pump.

The 61 to 70-penetration asphalt cement was shipped to a railroad siding approximately $\frac{1}{2}$ mile distant where an old traction-engine boiler mounted on a truck chassis heated the cars and operated a 3-inch pump used to unload the tank cars and transfer the asphalt to a 1,000-gallon tank truck for hauling to the plant site. At the plant this transfer truck drove up a ramp and discharged by gravity into any one or more of the five tanks, two of 12,000-gallon capacity, two of 15,000-gallon capacity, and one of 4,000-gallon capacity, which furnished sufficient storage to tide over any delays in receipt of asphalt.

The plant crew ordinarily used in this operation consisted of one man in the material tunnel, a scale-pugmill operator, a man to shovel in a small quantity of fine sand between the two driers, an oiler, a tractor driver, two firemen, and the plant foreman. Two other firemen were used at the track-side unloading boiler.

Six to nine 2,000-pound batches were generally hauled per load in hired trucks of varying capacities, and weighed on a 30,000-pound-capacity

Fairbanks-Morse truck scale erected close to the plant site. The ordinary output of the plant was 550 tons in each 8-hour day.

The asphaltic-concrete mix used for both base and wearing course on this job complied with the following gradations:

	Per Cent
Passing $\frac{3}{4}$ -inch sieve	100
Passing $\frac{3}{4}$ -inch sieve, retained on $\frac{1}{4}$ -inch sieve	26-38
Passing $\frac{3}{4}$ -inch sieve, retained on No. 10 sieve	22-30
Passing No. 10 sieve, retained on No. 200 sieve	25-35
Passing No. 200 sieve	4-7
Asphaltic cement	5-8

All of these percentages were based on the weight of the completed mix, including the asphaltic cement. A further requirement was that the material passing a No. 10 sieve, after the addition of collector dust and mineral filler, should meet the following specifications:

	Per Cent
Passing No. 10 sieve, retained on No. 40 sieve	30-50
Passing No. 40 sieve, retained on No. 80 sieve	16-32
Passing No. 80 sieve, retained on No. 200 sieve	16-32
Passing No. 200 sieve	8-16

Placing Bituminous Surfacing

Four to ten trucks were used on the average 5-mile haul and dumped into a Barber-Greene bituminous finisher. This machine laid a 12-foot lane down one side of the concrete base during a full day's operation, and moved back during the night to bring the adjacent side forward on the following day. To improve the stability of the center joint between the two adjacent lanes of surfacing, the leveling course was laid first on the left and then on the right half, and the top course was laid first on the right side, which had been laid second while placing the leveling course.

Since running for the entire day down one side of the road caused the center joint always to be laid against cold asphalt, it was rolled immediately behind the finisher by a 12-ton Huber 3-wheel roller, while additional material was added, if necessary, by two rakers working in conjunction with the finishing machine. This gave the maximum temperature of 350 degrees F for rolling the joint. After compacting this



"I just can't get that ex-Marine to use the air pressure!"

center joint properly, the roller backed up, cut across to the outer edge of the pavement, and progressed towards the center by lap-rolling. Because of the extremely hot weather encountered during the progress of this job, the 8-ton Austin tandem used for the final

(Concluded on next page, Col. 2)

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with "Precision" Air-Control

type 1201

High-speed production is the keynote of this post-war construction era. Big output must be maintained hour after hour without operator fatigue. It is possible to meet this requirement with the LIMA Type 1201 shovel, crane and dragline because all principal operating clutches are controlled by air. The clutches are extra large in diameter, easy to operate, and are free from constant adjustment. If you need a $3\frac{1}{2}$ yard shovel, a 65 ton crane, or a dragline, write for a copy of bulletin 121-B and learn more about the many advantages that are to be had with the LIMA Type 1201.

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SHOVEL AND CRANE DIVISION - - - LIMA, OHIO, U.S.A.

SHOVELS 3/4 YARD TO 5 YARDS DRAGLINES VARIABLE CRANES 13 TONS TO 100 TONS



An installation of Corr-Plate piling to permit excavation of a wet trench.

Steel Piling Now Renamed Corr-Plate

Because the name corrugated steel sheet piling has caused some misunderstanding of its structural characteristics, Caine piling has been renamed Corr-Plate steel piling by its manufacturer, the Caine Steel Co., 1820 No. Central Ave., Chicago 39, Ill. The new name is more descriptive, the firm says, as the piling is made of corrugated steel plate, not of steel sheet. The corrugations, cold-rolled by special machines, are said to give the piling great strength, per pound weight of steel, and high section modulus.

Corr-Plate steel piling is made in two types, interlock and standard. Sections of the former are connected by raising them high enough above the piling already installed to hook them in from the top. The standard piling is so arranged that the section to be installed is hooked into welded clips from the side, making its use possible in places of low headroom.

Literature on Caine Corr-Plate steel piling may be secured direct from the company. Just mention CONTRACTORS AND ENGINEERS MONTHLY.

A Correction

In an article on levee slope paving in the September issue of CONTRACTORS AND ENGINEERS MONTHLY, it was inadvertently stated that R. P. Farnsworth & Co., Inc., of New Orleans, contractor for the project, used Truscon No. 66 compound for curing the concrete. The material used should have been designated as Sealcure No. 66, which is made by Tuffalt, Inc., Pittsburgh, Pa.

Old Road Improved, Paved With Hot-Mix

(Continued from preceding page)

rolling did not ordinarily start work until nearly noon, as it was found that too-early rolling had a tendency to develop movement in the old concrete pavement utilized for base under 16 feet of the new pavement's width.

Principal Bid Items

The principal bid items involved in the bituminous-surfacing portion of this contract included the following:

Class B asphaltic concrete	27,000 tons
Asphaltic cement, 61 to 70 penetration	140 tons
Portland-cement concrete base	36,000 sq. yds.
Crushed stone in base, 3-inch down	53,500 cu. yds.
Crushed stone in shoulders, 3/4-inch down	8,600 cu. yds.
Crushed stone in cushion course, 1/2-inch down	1,500 cu. yds.

Personnel

The contract for this work, which included the widening of bridges as well as the old concrete pavement and resurfacing with hot-mix, was awarded by the Oregon State Highway Commission to Porter W. Yett, Portland, Oreg., in June, 1944. Robert D. Ellis was Superintendent for the contractor and E. E. Umphlette was Resident Engineer for the Oregon State Highway Commission directly in charge at the scene of the operations.

Concrete Blocks Are Profitable Sideline

A possible sideline for contractors is envisaged in concrete block-making, concerning which the Department of Commerce and the Department of Agriculture have recently published a bulletin, "Will Making Concrete Block Pay in Your Community". This experimental study, prepared with the assistance of the concrete-block and allied trades, discusses at length the possibilities of establishing concrete block-making as a profitable new business.

A new plant for this purpose can employ from 4 to 35 persons, the report says. The necessary materials—sand, gravel, cinders, or other coarse aggregate, cement, and water—are available in most communities. Because of its weight, the product is generally made near the place of use. Applicable to almost every type of building, the block is becoming increasingly popular. Factors to be investigated before establishing such a plant are discussed in the bulle-

tin, including competition from the other plants and from the production of other types of material.

The initial investment for a plant capable of 900 blocks a day is estimated at \$27,000. Methods of financing and production costs are discussed, along with the needed equipment, site, layout,

etc. In most plants the addition of special equipment would also provide production of cast stone, curb, concrete pipe, silo staves, and fence posts.

The bulletin may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 15 cents a copy.

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* The cushioning spring arrangement between the facings in ROCKFORD Spring Loaded CLUTCHES provides cushioned engagement that enables smooth pick-up of the load, without grabbing or chattering. The springs maintain ample pressure to assure the required torque.

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It shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications. Every production engineer will find help in this handy bulletin, when planning post-war products.

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Note: Deliveries of Sterling Wheelbarrows are being stepped up as rapidly as improvement in the raw material situation permits.

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Monterey County, Calif., precasts various-sized concrete slabs for drainage structures at its yard at Salinas.

Drainage Structures Built of Precast Units

Method Minimizes Work at Site, Reduces Delays to Traffic; Old RR Rails Used in Structures; Special Backfill of Boulders

In a county which contains much rugged topography, and roads and bridges of little use in inaccessible areas, as well as heavily traveled roads in highly developed agricultural parts of a central valley, an unusual approach to its drainage-structure problems is evidenced by the use of precast drainage structures and secondhand railroad steel for piling and pile caps.

In the early days of the development of the road system in Monterey County, Calif., many drainage structures were installed whose useful life has been exceeded, or which have become inadequate to handle drainage because of increased run-off due to the removal of cover and more intensive development. Replacement of these inadequate structures presented a problem, not only of expense but also in keeping roads open to necessary traffic where alternate routes were scarce or nonexistent. A policy of replacing them with concrete structures cast sectionally at the county's central yard was instituted and has proved to be so successful as to warrant its continuance.

Casting the Slabs

At the central yard in Salinas, a casting bed was prepared by pouring a concrete slab 24 x 48 feet in area alongside the track on which operates the county's yard crane. This is an old railroad steam-powered unit purchased economically some years ago and converted to gasoline power by removing the boiler and engine and installing a Hall-Scott engine in the cab. The crane has a 50-foot boom and is used with hooks or a clamshell bucket for innumerable jobs at the yard.

The casting bed has timber curbs with pre-cut division boards and provisions for their use to allow the casting of any size section of concrete. The slabs vary in size from 3.5 x 10.0 x 0.5 feet, containing 1.88 cubic yards of concrete with 200 pounds of reinforcing steel, to a top size of 8 x 21 x 0.58 feet with 3.5 cubic yards of concrete and 390 pounds of steel. Used crankcase oil is applied to the casting bed to prevent sticking of the newly cast sections. Then the reinforcing steel is placed and tied. In the past, concrete has been mixed in the 10-S Koehring Dandie mixer owned by the County, but the present procedure is to purchase ready-mixed concrete from a local plant. The delivering trucks drive down the yard on the west side of the crane runway and discharge their concrete into a clamshell bucket placed on the ground by the crane operator. The loaded bucket is then swung across the

track where the concrete is dumped into the forms on the casting bed.

By this procedure, a crew of three or four men handle the placing and finishing of concrete. After six days of water-spray curing, the precast sections are lifted by the crane and placed in stockpiles where they rest on timber separators. The same hooks and loops of steel, left protruding at the time of casting for later use in installing the sections, provide purchase for the cable-hooks used by the crane.

Installing a Precast Culvert

The bridge crew hauls the necessary precast sections to the site of the new structure, along with the necessary tools and a ½-cubic-yard P&H crane with clamshell, dragline, and shovel buckets. When everything is in readiness, the old structure is removed by the crane and the minimum necessary excavation performed by the attachment best suited to the conditions. In some locations a tractor with an interchangeable bulldozer and front-end



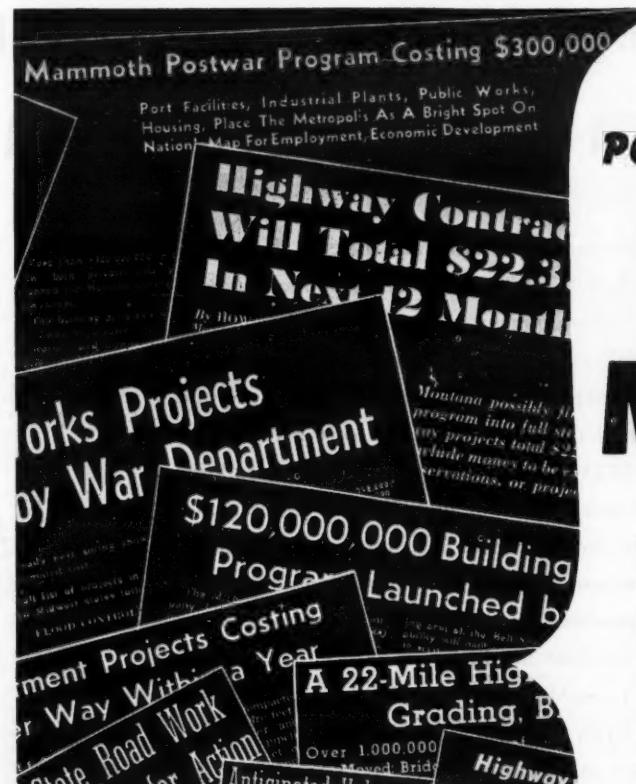
A Monterey County, Calif., bridge crew places the top precast section of a 4 x 8-foot concrete culvert.

loader can be used satisfactorily.

When the machine excavation is completed, requiring a minimum amount of hand finishing under the bottom slab,

the precast sections, consisting of bottom or floor slab, side walls, and roadway slab, are placed by the crane with

(Concluded on next page)



IN THE THICK OF POSTWAR CONSTRUCTION-

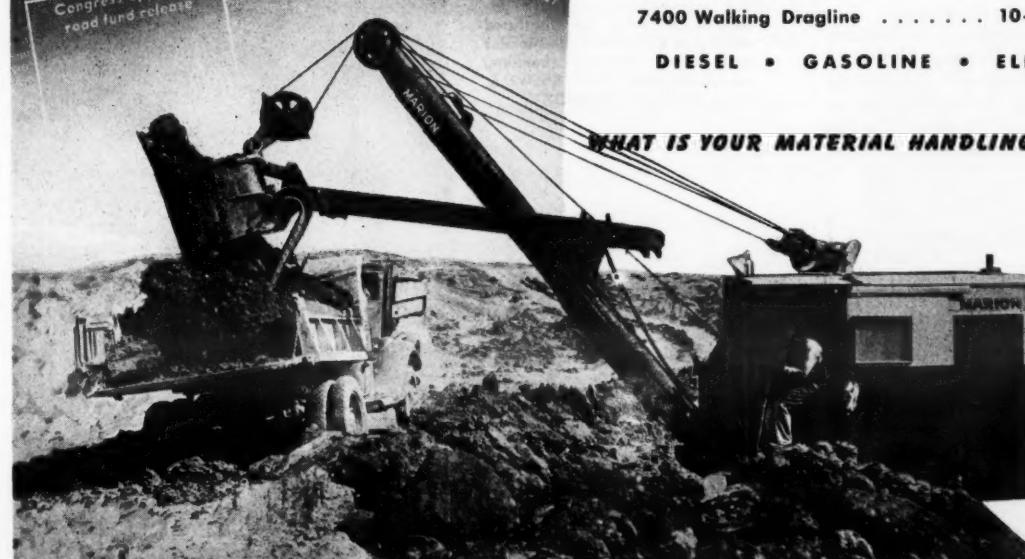
LOOK FOR THESE FAST — POWERFUL

MARIIONS

TYPE	CAPACITY
331	3/4 cu. yd.
362	1 1/2 cu. yds.
372	1 3/4 cu. yds.
93M	2 1/2 cu. yds.
40A	3 cu. yds.
492	3 cu. yds.
111M	3 1/2 - 4 cu. yds.
4161	5 cu. yds.
151M	6 cu. yds.
7200 Walking Dragline	6-7 cu. yds.
7400 Walking Dragline	10-12 cu. yds.

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3/4 cu. yd. to 40 cu. yds.

Drainage Structures Built of Precast Units

(Continued from preceding page)

a ground crew of four men; backfilling is completed, and the road is restored to service. Additional excavation necessary to improve the channel, and resurfacing, can be completed in a more leisurely manner.

Composite Structures

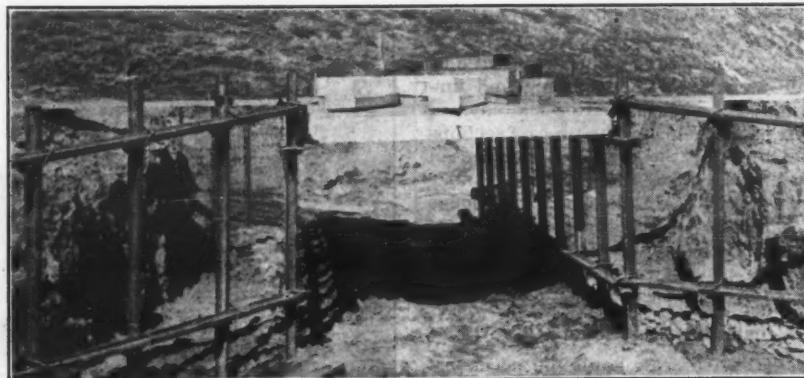
Another unusual type of drainage structure is sometimes built in Monterey County and has proved effective and economical where mountainous water courses are subject to flash floods. For this type, where large rounded boulders are available, the culvert walls and wing walls consist of old 45 or 50-pound railroad rails, driven vertically at 3-foot intervals and backed with 3-inch No. 8 wire mesh behind which a dry-rubble gravity-section retaining wall is laid to hold the approach fill.

A wide trench is excavated at either side of the culvert site. This is usually done by a bulldozer which then proceeds to roll rounded boulders from the adjacent streambed into the back part of the trench. Then the rails are driven by 30-foot swinging leads handled by a P&H crane using either a 2,400 or a 3,800-pound drop hammer. At the tops of the vertical rails below roadway elevation, two rails are welded horizontally, one on each side of the posts, with their bases turned up to form a flat pile cap. Diagonal braces are sometimes also welded to the vertical rails if their exposed height is more than 6 feet. By this method, structures with an inside height of 8 to 10 feet have been successfully built, though heights under 6 feet are preferred.

When the vertical posts have been driven, capped, and braced, and the wire mesh has been attached to them, the dry-rubble retaining wall is constructed back of the mesh by a combination of hand placing and crane handling of the larger boulders. More boulders are pushed up by the bulldozer to back the retaining wall and the approach fill completed with earth from the excavation.

The stream spans are usually of concrete slabs, either precast T-beam sections for the lesser spans, or deck sections, poured in place, supported by timber stringers or, in a few cases, by steel rails used for that purpose.

Design of these unusual structures is by the Monterey County Highway Department, with Howard F. Cozzens as its directing executive in his position as Road Commissioner. Construction by county forces is supervised by L. Cam-



One of Monterey County's composite drainage structures made up of old railroad rails for the side walls, and a precast slab top. Dry-rubble fill is placed against the mesh attached to the rails.

any who has served Monterey County as Bridge Superintendent for 20 years.

Hewitt Expands Facilities

Plans for the installation of new equipment to provide expanded pro-

duction have been announced by the Hewitt Rubber Corp., Buffalo, N.Y., manufacturer of industrial rubber products. A new primary rubber mixing machine, which increases the potential production at the main Hewitt plant by 50 per cent, is already in operation.

Other machines being added include a Chrysler injection molder for the mass production of large and small parts; an injection molder of Hewitt's own design, which is expected to introduce an entirely new process; and five additional high-speed automatic compression molding presses. Finishing facilities will be expanded to meet the increased production, company officials say.

In keeping with this expansion, the firm has announced the appointment of Arthur Purmort as District Sales Manager for Missouri, Indiana, central Ohio, southern Illinois, and Kentucky, with headquarters in St. Louis. William E. McCue has been appointed Sales Representative for the Cleveland and northern Ohio territory, and Robert Crane for the Indiana district. Mr. Purmort formerly served in the production and engineering departments. Mr. McCue was in the purchasing department and has been Traffic Manager since February. Mr. Crane has been attached to the Buffalo office.

10-TON CRANE MOBILE — A STURDY PERFORMER

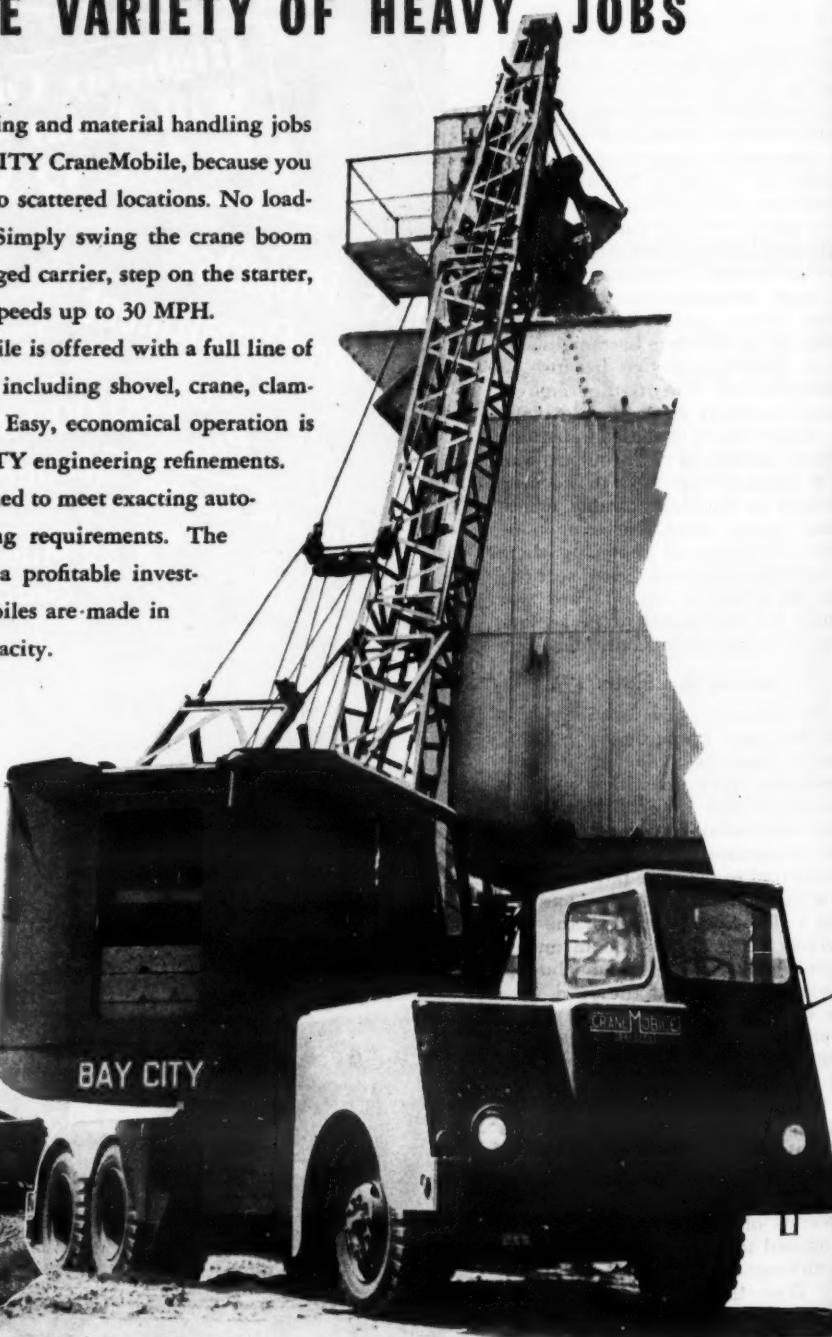
ON A WIDE VARIETY OF HEAVY JOBS

You can handle more excavating and material handling jobs more profitably with a BAY CITY CraneMobile, because you can shuttle your equipment to scattered locations. No loading or unloading necessary. Simply swing the crane boom over the front end of the rugged carrier, step on the starter, and you're on your way—at speeds up to 30 MPH.

The BAY CITY CraneMobile is offered with a full line of convertible boom equipment including shovel, crane, clamshell, dragline, or trenchhoe. Easy, economical operation is assured by the many BAY CITY engineering refinements.

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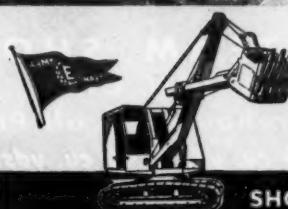
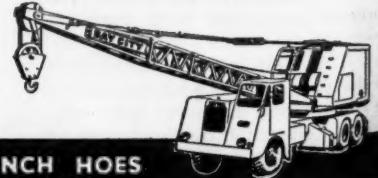
The Biggest Little Hoists in the world for use where power is not practical, available, or sufficient.
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With patent gear change and positive internal brake that never fails, and will lock load.
Gear Ratios Weight Price
2-Ton 4 & 22 to 1 60 lb. \$ 55
2-Ton 4 & 24 to 1 110 lb. 75
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Homelite generators provide power for floodlights and tools on many types of jobs. Here a unit aids in emergency repair to a railroad trestle.

Portable Generator For All Conditions

A wartime development of interest to contractors and highway maintenance men is a compact, light-weight, all-weather portable gasoline-driven generator manufactured by the Homelite Corp., Port Chester, N. Y. Designed to serve the armed forces in every clime, under every condition, and on any grade of gasoline, the generators have provided light and power for construction under combat conditions, lights for beacons and landing strips, and auxiliary power sources in planes, tanks, and small vessels.

A typical unit providing 2,000 watts at 120 volts dc weighs only 105 pounds, and is approximately 24 inches long, 17 inches wide, and 21 inches high. Peace-time uses for the generator include emergency repairs, disaster work, construction and maintenance of highways, etc. A major contribution to the versatility and dependability of these units is made by a small resilient seal, less than $\frac{1}{4}$ inch in diameter, used in the carburetor needle valve adjustment, and produced from gasoline-resistant synthetic rubber by the Hycar Chemical Co., Akron, Ohio.

The needle valve in the generator's carburetor had to be sensitive and capable of extremely precise adjustments, yet sturdy enough to maintain the adjustment under the most adverse conditions, while insuring against leakage. This required that the seal have definite limitations on swelling with any grade of gasoline, including aromatic fuels, be non-binding, non-adherent to the metal shaft, and effective at temperatures down to minus 65 degrees F. A number of other Hycar seals and gaskets are used on this portable generator, to assure proper performance under extreme service conditions.

Full details on this unit may be secured direct from Homelite.

Wartime Employment On Highway Projects

Employment on highway construction under state supervision reached its lowest wartime ebb during the early months of 1945, figures released by the Public Roads Administration indicate. From January through August, an average of only 18,224 persons was employed each month. Of these, 7,959 were at work on projects involving Federal funds. In June, road building employed 24,366. This increased slightly to 28,157 in July, and 28,419 in August.

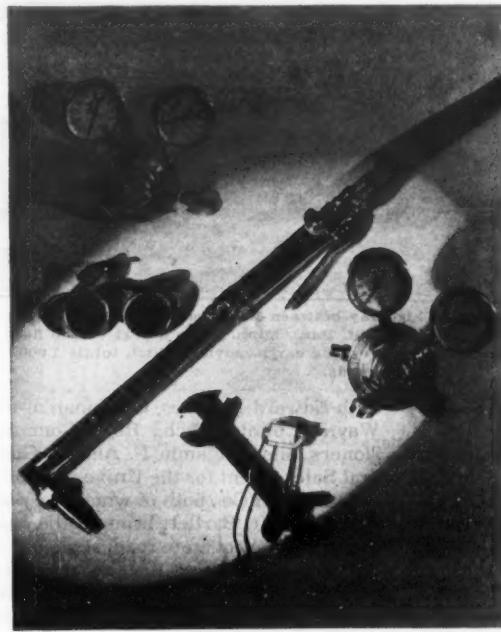
The average monthly employment on construction, which stood at 108,219 in 1941, declined steadily as the war progressed. Normal highway programs

ceased but were replaced to some extent by access-road building in 1942 when the monthly average was 70,173. As highway work decreased still more this figure dropped to 45,042 in 1943 and 24,648 in 1944.

State-supervised maintenance work also declined during the war, though at a lesser rate than construction. Maintenance employed 119,108 in an average month during 1941, as compared with 90,294 during the current year.

ARBA Appoints Macatee Manager of Airport Div.

Walter R. Macatee, Washington, D. C., has been appointed Manager of the Airport Division of the American Road Builders' Association. A member of the ARBA since 1916, Mr. Macatee has most recently been special Washington representative for The Asphalt Institute. Previously he was connected with the Edison Portland Cement Co., and for eleven years with the Asphalt Department of the Texas Co.



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Ad 104

Now Available... McKERNAN-TERRY SINGLE-ACTING PILE HAMMERS

Supplementing the widely known line of McKernan-Terry Double-Acting Pile Hammers designed to meet all conditions ordinarily encountered in pile driving, McKernan-Terry has applied the experience of nearly fifty years to make available a standard line of Single-Acting Hammers, and for the past twelve years has been building Single-Acting Hammers for special projects.

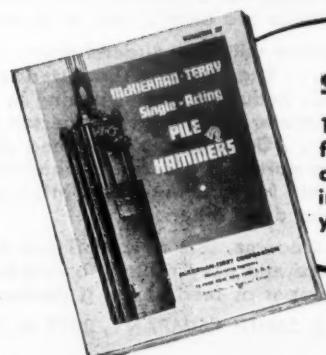
These hammers are best suited for driving through very dense substances like stiff blue clay, heavy "gumbo," incipient shale, hard pan or compacted gravel, and in driving heavy mass piles, such as pre-cast concrete, where lower velocity at point of impact is necessary to avoid undue strain on piling and ram.

Built of highest quality heat-treated alloy steel forgings and heat-treated alloy steel castings. Cast mephanite steam cylinders. Welded steel bottom cylinders. Piston and ram, heat-treated alloy steel forgings.

Completely enclosed—all working parts protected from sand, grit, foreign matter.

No exposed working parts—reducing hazards to workers.

Only single-acting hammers that can perform under-water work, making possible the use of shorter piles—saving labor, time, material.



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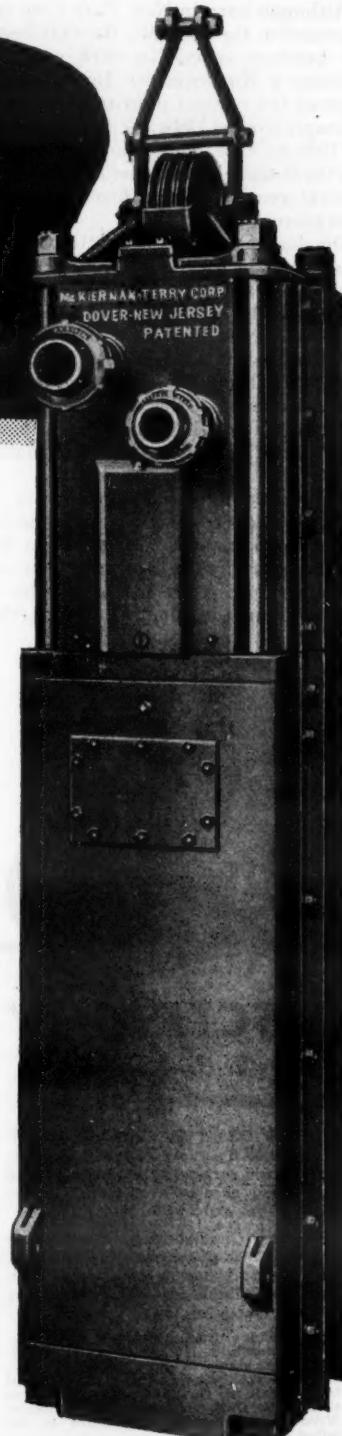
16 pages. Just off the press. Gives specifications, diagrams, operating details, concise tabulation of advantages appealing to engineers and contractors. Send for your free copy—ask for Bulletin No. 57

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19 PARK ROW

NEW YORK 7, N. Y.





The contract for an 8½-mile section of highway between Robbinsdale and New Brighton, Minn., was awarded to A. Guthrie & Co., St. Paul, Minn. Here a part of the fleet of Caterpillar diesels and scrapers is at work on the earth-moving which totals 1,000,000 cubic yards.

The Grand Old Man Of Concrete Dies

The "Apostle of Concrete", George S. Bartlett, died October 21 at the age of 87 in Chicago. Known from coast to coast as one of the greatest single influences in the use of concrete in road building, he was Assistant to the Chairman of the Board of Directors of the Portland Cement Association at the time of his death.

Although born in New York City and educated in the East, Mr. Bartlett began his business career in 1879 with the Chicago & Northwestern Railway. He entered the cement industry in 1884 as Manager for the Milwaukee Cement Co. In 1905 he took charge of the Western Portland Cement Co., holding the post several years until the firm suspended operations.

On leaving the Marquette Cement Mfg. Co., Chicago, in 1912, Mr. Bartlett undertook the promotion of concrete roads for the Universal Atlas Cement Co. He served for three years as Vice President of the Edison Portland Cement Co., Orange, N. J., before returning to Universal Atlas as a special representative in 1916, a post he retained until retiring to serve the Association in 1931.

The unusual method of promotion by which the concrete road was brought to the nation's attention arose from Mr. Bartlett's originality, and his vigor and resourcefulness were responsible for its extraordinary development. Together

with Edward N. Hines, Chairman of the Wayne County, Mich., Road Commissioners, and Benjamin F. Affleck, General Sales Agent for the Universal Portland Cement Co., both of whom are now deceased, Mr. Bartlett brought the customers to the concrete road, since it was not possible to bring the road to them.

Commissioner Hines had laid experimental stretches of concrete paving in

Detroit in 1909. Mr. Bartlett transported officials and engineers from all over the country to inspect this, with such success that in 1936 *The Nation's Business* asserted that he had probably sold more concrete than any living man. Though 78, and twice retired by his own industry, Mr. Bartlett was selling concrete even then.

As a permanent symbol of his achievements in highway construction, The George S. Bartlett Award was created by his friends in 1931. Consisting of a plaque on which his likeness appears in bas relief, the Award is sponsored by the American Association of State Highway Officials, the American Road Builders' Association, and the Highway Research Board. It is given annually by the presidents of these groups to an individual selected for "outstanding contribution to highway progress". Among other acknowledgements of the industry's debt to Mr. Bartlett was an honorarium on his first contemplated "retirement" in 1916, and a trip to South America and Europe

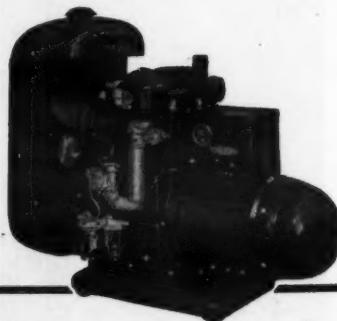
given him and his wife in 1928, on his 70th birthday.

Booklet on Blacksmith's New Mechanical Helper

With the Blacker power hammer, one blacksmith can handle any hand-forging operation alone, and can produce more work than if he were assisted by two helpers, says a new booklet recently issued by its manufacturer.

This blacksmith's "mechanical helper", in which the hammer and anvil are combined in one direct-gear electric device, is described in detail in the 16-page illustrated brochure. Specifications, features, mode of operation, and other data are presented. Photographs and diagrams outline the construction of the hammer, and methods of adjustment and lubrication are discussed.

Readers of CONTRACTORS AND ENGINEERS MONTHLY may procure copies of this booklet, Bulletin 56, by writing to the McKiernan-Terry Corp., Park Row Bldg., New York 7, N. Y.



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* ONAN ELECTRIC GENERATING PLANTS supply reliable, economical electric service for engineering and contracting uses as well as for scores of other general applications.

Driven by Onan-built, 4-cycle gasoline engines, these power units are of single-unit, compact design and sturdy construction. Suitable for mobile, stationary or emergency service.

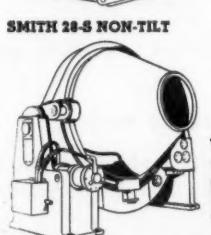
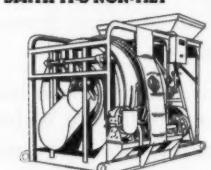
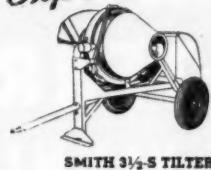
Models range from 350 to 35,000 watts. A. C. types from 115 to 660 volts; 50, 60, 100 cycles, single or three-phase; 400, 500, and 1000-cycle, single-phase; also special frequencies. D. C. types range from 6 to 4000 volts. Dual voltage types available. Write for engineering assistance or detailed literature.

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And, of course, this new 16-S has the famous Smith drum with its fast discharge and easy rolling "end-to-center" mixing action. Available with batchhopper or feed chute, if desired. Write for literature.

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CONCRETE MIXERS

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Steam Dredge Used In Savannah Harbor

DeWitt Clinton Maintains 30 x 500-Foot Channel For U.S.E.D.; 18-Inch Pontoon Discharge Line

THE steam suction dredge DeWitt Clinton, owned by the U. S. Engineer Department, is maintaining a 30 x 500-foot channel in the Savannah River, Ga., at the port of Savannah about 20 miles inland from the Atlantic. Large amounts of silt are continually being deposited in the channel, brought down by the river as it flows southeasterly, dividing South Carolina and Georgia, and constant dredging is required to keep the channel to its proper depth.

This type of maintenance dredging is seldom let to contract as the river shoals are always shifting, and it would be extremely difficult to estimate the amount of work needed or to measure the work done. From the upper end of the harbor the DeWitt Clinton works along a 12-mile stretch towards the sea, while the channel at the lower end of the river near the mouth is maintained with hopper dredges.

Along Savannah harbor the river is 1,000 feet wide with the 500-foot channel down the middle, and as the dredge has a 280-foot swing it works first one half of the channel and then the other, removing an average depth of 2 feet of silt from the 30-foot-deep channel.

General Description

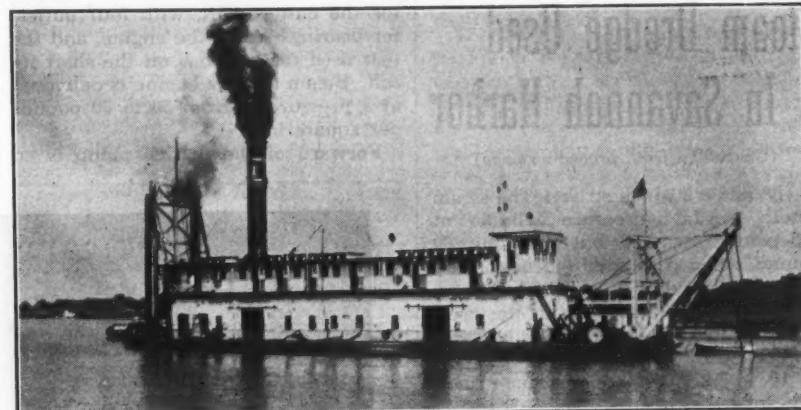
The DeWitt Clinton is a steam-driven hydraulic suction dredge with a 21-inch intake and an 18-inch discharge line, and was only recently transferred to Savannah from New York where it had also been engaged in harbor dredging. Built in 1932 by the Ellicott Machine Corp., Baltimore, Md., the dredge has an all-steel hull made from $\frac{3}{8}$ -inch plates and measures 140 x 36 x 9 feet. Above the deck the superstructure is painted a glistening old ivory, with a single, all-black smokestack aft over the boiler room. On a band around the stack are the U. S. Engineers' castle insignia.

At the bow is a 35-foot A-frame supporting a 65-foot ladder which can be lowered so that its 84-inch-diameter cutter head can dig at a 50-foot depth if necessary. A new type of gage to indicate the depth at which the cutter head is working has been rigged up, consisting of a small tube running down the ladder to the cutter head, with a trapped-air column at the end of the tube connected to a manometer. The depth could be recorded by hydrostatic pressure, but a shortage of mercury precluded the use of this device. Department engineers are now working on an air-pressure type of gage which will be connected to a recording graph so that a continuous record of the depth at which the dredge is working will be obtained. In the meantime the dredge operator can get his depth from the standard mechanical gravity-type gage fastened to the A-frame.

Exceptionally strong flood currents cause great difficulty in keeping the bow of the dredge pointed downstream when making wide swings in the channel. The average tide at Savannah is $7\frac{1}{2}$ feet which increases to $9\frac{1}{2}$ feet during spring tides. To aid the dredge in pulling against these currents, a head anchor is thrown out with 900 feet of $\frac{3}{8}$ -inch-diameter cable line which is attached to the dredge by passing through a sheave at the very top of the A-frame. From this sheave the cable runs down to the deck of the dredge and is connected to a Mundy hoist which is operated by a 100-hp engine driven by auxiliary steam.

The Steam Equipment

The boiler room is located near the stern of the dredge and is partitioned off from the rest of the craft by a $\frac{1}{4}$ -inch steel bulkhead, fore and aft. Here is located a large Hedges-Walsh-Weidner boiler having 3,565 square feet of heating surface, which is fired by three forced-draft fuel-oil burners. A Todd oil-burner system with a Dean pump feeds the oil to the furnace at a pressure of 175 to 225 pounds to the square inch, and at a temperature of 210 to 240 degrees F. On top of the boiler is a steam dome, 45 inches in diameter and 14 feet long, where steam at 225 psi is developed. A glass water gage shows the amount of water contained at any time in the boiler. The boiler room is ventilated by an 18-inch blower



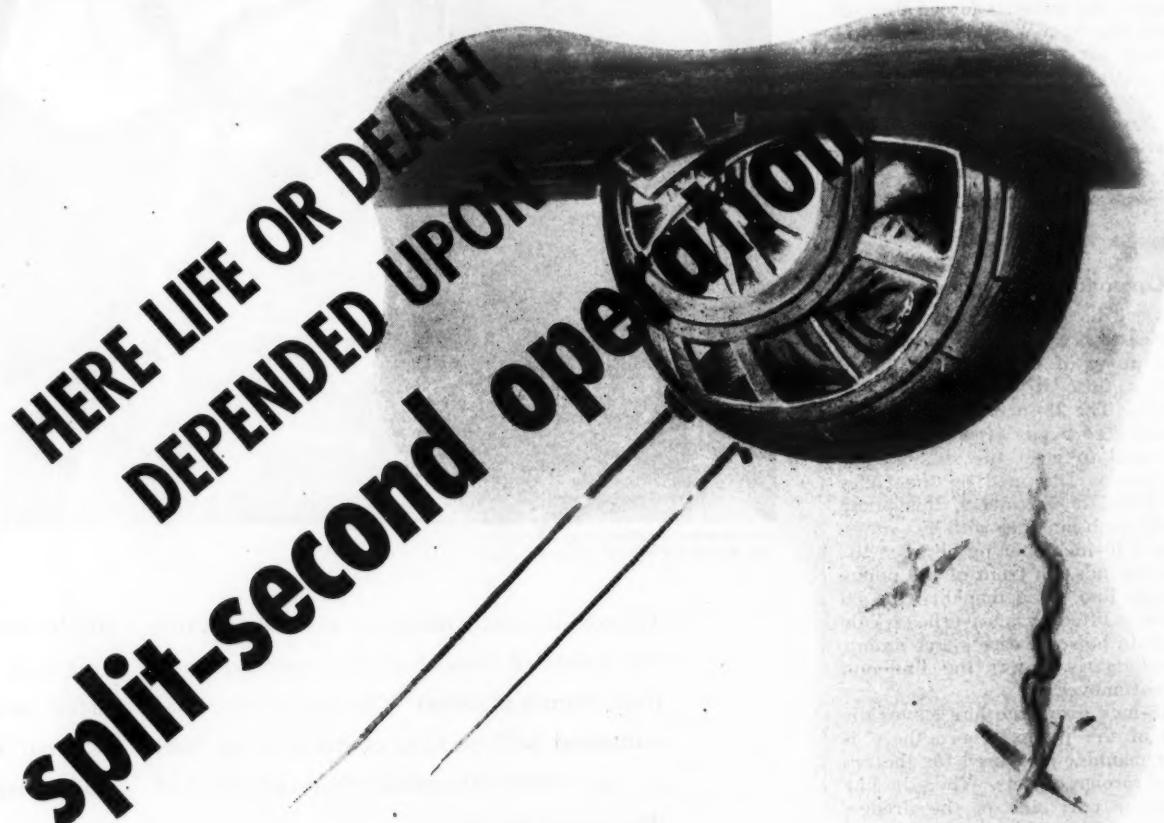
U. S. E. D. Photo
The U. S. Engineer Department in Savannah, Ga., uses its steam suction dredge DeWitt Clinton to maintain a channel in the Savannah River.

that forces cool air down from the upper deck.

Through a 6-inch-diameter asbestos-insulated steam line the live steam leaves the top of the boiler and is carried overhead immediately forward to

the engine room. The prime mover is an Ellictott triple-expansion 567-hp engine, whose cylinders have bores of 12, 20, and 33 inches, for high, intermediate, and low-pressure work respectively.

(Continued on next page)



VICKERS HYDRAULIC CONTROLS Are FASTER on Construction Equipment, too

When enemy fighter planes rushed in for the kill, bomber turrets had to start shooting right now. A split second often was the difference between life and death to the bomber crew. Guns had to move instantly and accurately at the will of the gunner. Vickers Power Hydraulic Control provided this speed and precision on many AAF bombers.

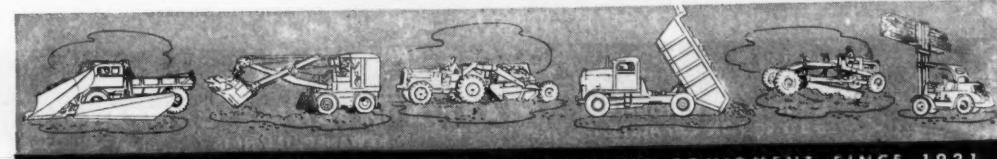
Fast, accurate control is important in construction equipment, too. While lives seldom depend upon it, machinery that can be operated rapidly, accurately and continuously may mean the difference between profit and loss.

Vickers has been building power hydraulic controls for construction equipment for 15 years. We've learned how to make them fast, accurate, and instantly responsive to the touch of a finger no matter how heavy the job. Vickers Power Hydraulic Controls have no clutches or brakes to wear or fail at critical times . . . no complicated linkages. Cables and sheaves are usually entirely eliminated but when used can be automatically protected against overload. Vickers controls employ oil to transmit the power impulses, hence are inherently self-lubricated and exceptionally durable.

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Steam Dredge Used In Savannah Harbor

(Continued from preceding page)

tively, and a 20-inch stroke. The steam enters the high-pressure cylinder at 225-pound pressure but drops to 60 pounds when it is admitted to the intermediate cylinder, and continues dropping, in inverse ratio to the area, until at the low-pressure valve and cylinder the steam has been reduced to 10 to 12 pounds per square inch atmospheric pressure.

On the port side of the engine, which works on a 26-inch vacuum, is a cylindrical condenser, 11 feet long x 3 feet in diameter, containing 720 brass tubes each 9 feet long x $\frac{3}{4}$ -inch diameter. When the hot steam passes over these tubes with river water running through them, it is rapidly cooled with a corresponding shrinkage of one cubic foot of steam condensing into one cubic inch of water. From the bottom of the condenser, the water is forced through a 5-inch line by a Worthington 10 x 18 x 12-inch air pump into a hot well where any grease is strained from the water. A feed pump then moves the water through a line back to the boiler room where it is raised to 225 degrees F in a Reilly heater by exhaust steam, and then returned to the boiler where the cycle of turning into steam commences again.

Operation of the Dredge

Forward of the main engine and connected to it by a direct drive is the suction pump of the DeWitt Clinton, located a little to the starboard of amidships. The 21-inch intake pipe has two 45-degree bends after leaving the cutter head to meet the slightly off-center pump. Designed by the Office of the Chief of Engineers, this pump has an 88-inch impeller with five vanes, and has a 10-inch opening between the runner shrouds. In front of the pump, the intake line has a manhole, the lid of which is lifted by an overhead Yale 5-ton chain hoist, in case a tree stump, or other debris, enters the line and must be removed.

An 18-inch discharge line leaves the bottom of the pump, where there is another manhole also used for the removal of foreign objects. When the line reaches the port side of the dredge, it makes a right-angle turn, and runs aft for about 30 feet along the bottom of the hull where it bends upward, rises to deck level, and continues to the stern. Here the pipe leaves the dredge on floating pontoons. The average vacuum at the pump is 10 to 12 inches, while the pressure in the 18-inch discharge line varies between 35 and 45 pounds.

Driving the cutter head at the bow is an 11-inch bore x 14-inch stroke two-cylinder 200-hp engine operating from an auxiliary steam line from the main boiler. A one-shot central lubrication system is located on the ladder

for the cutter shaft, with four outlets for bearings under the engine, and the rest used for bearings on the shaft itself. Steam for this engine is delivered at a pressure of from 50 to 60 pounds per square inch.

Forward of the dredge pump is an

Ellicott winding-gear engine also driven by steam at a pressure of from 50 to 60 psi. This engine turns a large gear wheel on a shaft extending across the front of the deck near the bow to which are connected five hoist drums. The hoist at the center operates the ladder,

while the next two hoists, one on each side, control the swing line, and the outside pair lift the two spuds at the stern.

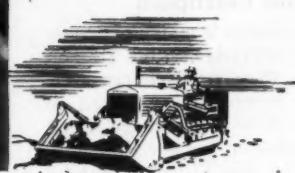
Dredge Movements

By means of the 1½-inch line and the
(Concluded on next page)



Cold riveting track frames with a Hydraulic Take Riveter in the Oliver "Cletrac" plant.

Added attraction!



To provide greater resistance to shocks, strains and twists of crawler tractor operation, the track frames of Oliver "Cletrac" tractors are reinforced with sections of heavy plate steel . . . an "added attraction" that adds years of dependable service.

Strategically located to provide greatest strength, these steel sections are securely riv-

eted in place by modern hydraulic riveters. This extra protection is typical of the many added features that are standard on Oliver "Cletrac" tractors. Through the use of the most modern equipment and production methods, quality is built in...high cost is engineered out.

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5 TO 20 TON CAPACITY

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'CROSS TOWN OR 'CROSS-COUNTRY..WITH ECONOMY

There's a proper size of safe, easy-loading MARTIN TRAILER to hustle light equipment 'cross town—or to highball a giant D8-Dozer 'cross-country—with economy.

Your "CATERPILLAR" Dealer is your MARTIN Dealer. See him for your trailer needs.

MARTIN MACHINE COMPANY
KEWANEE, ILLINOIS

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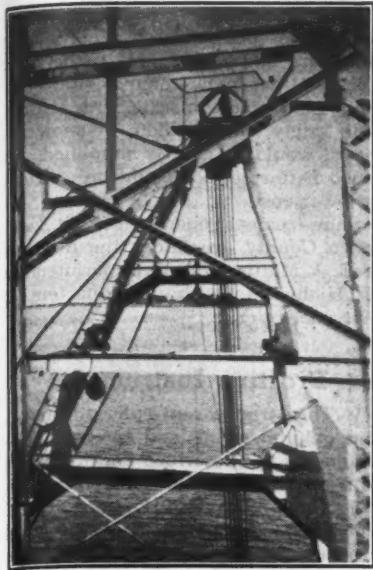
★ Buy Victory Bonds

★ Save Waste Paper

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★ Be a Blood Donor

★ Pay only Ceiling Prices



C. & E. M. Photo
A 35-foot A-frame supports the 65-foot ladder of the U. S. E. D. steam suction dredge DeWitt Clinton.

Steam Dredge Used In Savannah Harbor

(Continued from preceding page)

swing hoists, the dredge can swing 280 feet in making a cut, while the anchors to which the line is fastened far out on each side are moved ahead about the length of the dredge by a launch as the dredge advances longitudinally. The dredge moves in this direction with the help of the starboard or walking spud, while the port spud is the digging spud, as it is anchored in the river bottom when the dredge is pumping.

The two twin stern spuds are 65 feet long, 27 inches in diameter, made from hollow cast steel, and weigh 15 tons each. Located outside the stern of the dredge, the spuds are each held in place by two bands, one placed at deck level and the other near the bottom of the hull. Also on the after deck is a compartment housing a steam-driven compressor for the ammonia used in the refrigeration system which preserves the food for the crew who are quartered on the upper deck. A complement of sixty men is needed on the dredge for the three full crews in continuous 24-hour operation on a six-day week.

Two dynamos are located in the after portion of the main engine room; one of 7½ kw furnishes electric light and power for use during daylight hours, and the other, a 15-kw unit, furnishes additional power for floodlights and searchlights used during night operations.

Machine Shop

The interior of the DeWitt Clinton is as spotlessly clean as the shining white walls of the superstructure, including the machine shop which is located to the rear of the winches. The equipment is driven by electric motors and includes a Rockford 13-inch lathe with a 14-foot bed, a Marvel 17-inch-blade power hack saw used for cutting pipe, a Dreses 24-inch drill press which will take bits from $\frac{1}{4}$ to $2\frac{1}{2}$ inches, an Oster pipe-threading machine used for pipe with diameters from $\frac{1}{2}$ to 4 inches, and a Clark electric grinder.

Alongside a work table outfitted with bench vises is a Rahn-Larmon 9-inch lathe with a 22-inch bed. On the port side amidships is a Lux fire-extinguishing system, consisting of eight tanks, which connects to the boiler room where there is a nozzle every 6 feet through which carbon-dioxide gas can be sprayed should a fire break out.

Below decks are two 10,000-gallon tanks for bunker C fuel-oil of which the dredge burns an average of 4,000 gallons every day. The dredge also uses about

40,000 gallons of water a week which is brought from the city water mains of Savannah on a barge, and stored on the dredge in two tanks in the hull near the stern, holding 14,000 gallons each, and two tanks in the bow, each with a capacity of 17,000 gallons.

Dumping the Silt

Contained in the silt which the dredge sucks up from the bed of the river is a lot of swamp gas which often reduces the vacuum in the suction line to the pump, causing the pump to pound to a considerable degree. This is offset by inserting a steam line into the intake pipe to serve as an injection to prime the pump. As the watery silt goes through the dredge, it passes through a flapper valve at the stern which closes when the pump is not running; otherwise if the dredge were working against a head the water would run back through the dredge if the pump shut down for any reason.

Beyond this valve the outlet pipe leaves the dredge through a flexible

connection consisting of a cast-steel articulated ball-and-socket joint, and is then carried on a floating pontoon line which varies in length from 80 to 1,600 feet. Each 40-foot length of 18-inch steel pipe is supported by two pontoons, one on each side of the pipe and running lengthwise with it. The pontoons are made of steel plate, cylindrical in shape, 24 feet long, 4 feet in diameter, and pointed at the ends. They are 19 feet apart and are connected by two 12 x 12's, one at each end, fastened to the pontoons with U-bolts.

The pipe is lashed to these strongbacks, and over the pipe is built a catwalk of two 2 x 10's with a hand safety rail made from a 2 x 4 supported every 6 feet by a 2 x 4 post. The 18-inch land line is from 500 to 3,000 feet long and comes in 16-foot lengths, which is more easily moved about by hand with the eight-man crew that looks after this pipe. The line discharges the material a few hundred feet back from shore whenever possible so that the silt will not run back in the river.

Personnel

The DeWitt Clinton will remain at Savannah harbor until it is no longer needed, but as the port has been extremely busy with wartime shipping and will continue to require deep water, the assignment of the dredge is somewhat of a permanent nature. Captain W. B. Robertson is Master of the dredge and F. J. Chase is Chief Engineer. For the U. S. Engineers in charge of Department work in the Savannah District, Lt. Col. L. P. Larson is Acting District Engineer; Major C. F. Trainor, Chief of Operations; and Leonard Dozier, Chief of Operations for Civil Works.

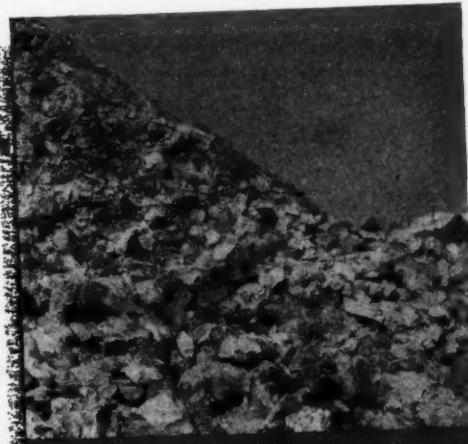
Clyde Dealer in Indiana

The Reid-Holcomb Co., 370 So. Illinois St., Indianapolis, Ind., has been authorized as a sales and service agency for the entire line of construction and material-handling equipment of the Clyde Iron Works, Duluth, Minn., maker of hoists, derricks, car pullers, whirleys, and logging equipment.

CRUSHING FLINTROCK

ONE OF THE HARDEST AND MOST ABRASIVE ROCKS IN THE WORLD

with PIONEER EQUIPMENT



Top quality ballast for Santa Fe Railroad



Primary Crusher Mill - Secondary Crushers
Jaw Crushers - Roll Crushers - Screens - Conveyors - Feeders - Washers



Primary Crusher Mill - Secondary Crushers
Jaw Crushers - Roll Crushers - Screens - Conveyors - Feeders - Washers

• This is one of those interesting jobs that men who make their living in pit and quarry enjoy reading. It begins with the Santa Fe railroad which has recently installed new high-speed trains on its main line west of Kansas City. It was found that limestone ballast did not stand up under severe service.

Chats, which are rejects from lead and zinc mines near Joplin, Mo., were available, but their size was minus $\frac{3}{8}$ " and too fine for ballasting the main line for high-speed trains.

Also available were great piles of flintrock which the mine operators had rejected as uncrushable. The mining section of W.P.B. advised that this rock was the most abrasive known in the U. S. and equalled only by one known rock deposit in the world located in South Africa.

Harold Youngman of Baxter Springs, Kansas, took the contract to crush this flintrock to $1\frac{1}{2}$ " minus. The following PIONEER equipment is doing the job:

- a PIONEER No. 56 Primary Crusher, which consists of a Grizzly feeder and a 2436 Primary Jaw Crusher
- a PIONEER 1536 intermediate jaw crusher
- a PIONEER 48-V plant which includes a 1036 jaw crusher, a 40" x 22" roll crusher and a 4' x 12' vibrator screen.

Because of the extreme abrasiveness of the rock, it was found that better results could be obtained by using the four crushers and closing down the top opening on the jaw crushers, thus reducing the angle between the jaws and increasing the manganese life several times.

PUT IT UP TO PIONEER

You may never have a job like Mr. Youngman's, but whatever your job you'll want Pioneer equipment—the dependable equipment built with extra margins of performance for extra profits.

Pioneer
ENGINEERING WORKS

Jaw Crushers - Roll Crushers - Screens - Conveyors - Feeders - Washers

ENGINEERS and
MANUFACTURERS of
QUARRY GRAVEL
MINING MACHINERY
Washers

MINNEAPOLIS 13, MINN.

County Removes Snow For \$130 Per Mile

Both County-Owned and Hired Units Used to Battle Heavy Snowfall in 1944-45; County Clears 483 Miles Of State Highways

ALTHOUGH suffering from a shortage of operators and a serious lack of spare parts to keep old equipment in use, St. Lawrence County, largest in the state of New York, succeeded in keeping the state highways within the county limits open and cleared of snow during the severe winter of 1944-1945 at a cost of only \$130 per mile of road. Strung out along the international boundary of the St. Lawrence River in northern New York, this county, with its 2,772 square miles of area, is larger than either Rhode Island or Delaware, and embraces a road system totaling 3,190 miles, of which 483 miles are state highways.

The annual snowfall in this section is generally high, and the 88½ inches of snow that fell last winter between November and April, as reported by the Government station at Canton, was no exception to the rule. Winter began in earnest with an 18-inch fall of snow on November 30, 1944, and was followed by two months of continuing heavy precipitation. The winter's snowfall by months was as follows:

November	18.0	inches
December	28.8	"
January	26.8	"
February	11.2	"
March	2.1	"
April	1.6	"
Total	88.5	"

Along the St. Lawrence River, the snowfall is generally greater than at Canton, and in the southern part of the county where the elevation is much higher, the snowfall is also greater. Last winter at Wanakena it was reported to be more than 150 inches. The State Ranger School makes observations in the vicinity of Wanakena, and has in the past reported snowfall almost twice the figure recorded above.

St. Lawrence County comprises thirty-two townships which have the individual responsibility of removing snow from the town and county roads lying within their boundaries, amounting to a total length of 2,707 miles, while the County handles snow removal on the state highways. The breakdown of the road mileage in the county at the different levels is as follows:

Classification	Miles
Town roads	2,277.33
County roads	430.10
State highways (outside villages)	453.83
State highways (within villages)	29.20
Total	3,190.46

State Highways

The 483 miles of state highways, both inside and outside village limits, were kept free of snow by utilizing not only all available county equipment, but also hiring trucks and equipment from the townships and from private contractors and paying for their use on an hourly basis. The total amount of equipment used on this work included thirty-three trucks of various makes and sizes fitted with plows, and seven power graders. Of the trucks, six were county-owned, including four 10-ton trucks, viz., two Walters, one Coleman, and one FWD; and two FWD 7-ton trucks. The County also employed its three Austin-Western No. 99 power graders for removing hard snow and slush.

Storehouses for county equipment are located at Canton, the county seat, and at Norwood, which are centrally located with respect to the main state highways. During the intensive work of snow removal, the average force of eleven permanent county employees was augmented by men hired from the

construction crews which work on the roads in the summer. Regular routes were assigned for each equipment unit to keep clear, but these were shifted around at times to suit changing conditions.

The man-power shortage was keenly felt during these months of snow fighting, but the greatest drawback to efficient operation was securing repair parts for the old, and in some instances, obsolete equipment which could not be replaced.

Costs

The total cost of clearing snow from the 483 miles of state highways within St. Lawrence County for the winter of 1944-1945 amounted to \$62,697. The County was later reimbursed by the State for one-half of this expenditure. Counties in New York State receive aid for snow removal on the state highway system for one-half of the amount expended, after the expenditures are approved by examiners of the Comptroller's Office, up to the amount of \$75

per mile. Where the cost exceeds \$150 a mile, and in some cases it is as much as \$200 to \$300 per mile, the excess amount over \$75 is borne by the county. Any sanding or applications of calcium chloride or sodium chloride to the roads was done by the regular State Division of Highways maintenance forces.

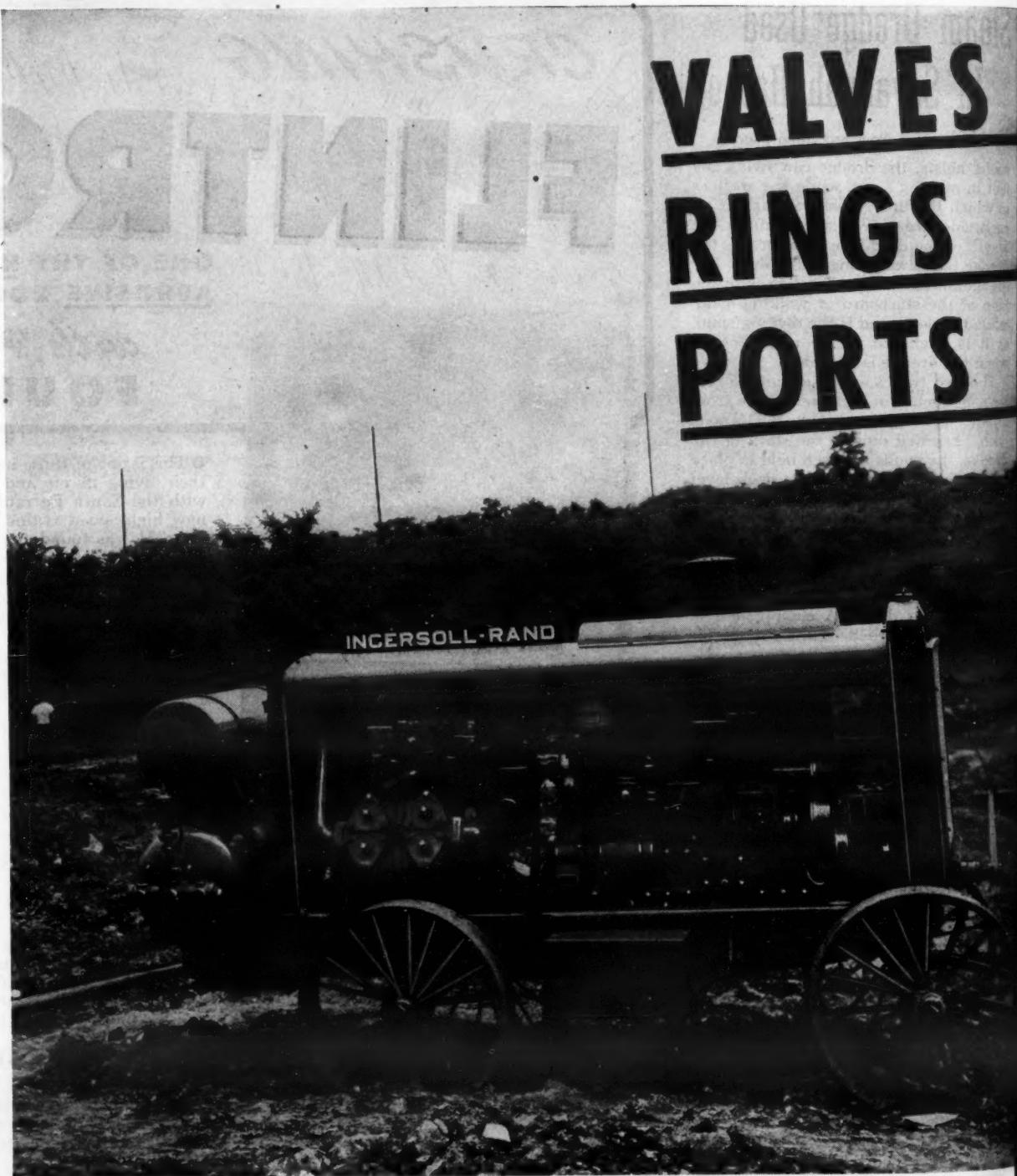
Part of the problem of snow removal on the state highway system is the condition of a considerable mileage of the roads, particularly along their margins, which makes this mileage almost unfit for snow removal. Many of the older state highways have narrow shoulders, deep roadside ditches, and beyond those a mixture of boulders, stumps, trees, and brush lines. In some places there are abrupt backslopes relatively close to the pavement which prevent the displacement of large quantities of snow deposited in the highway, largely because of these abrupt slopes, brush lines, buildings, and other obstructions. Frequently, trees or telephone and electric poles are so close as to be hit by the wings of the plows. If the mar-

gins of these roads were cleaned up and graded to provide reasonably wide shoulders and flat slopes to the ditch lines, so that snow-removal and other equipment could operate with reasonable safety, the problem of snow removal would be greatly simplified, and much better service could be provided at lower cost.

Snow-removal operations in St. Lawrence County are under the direction of E. J. Mattis, County Superintendent of Highways, with headquarters at Massena, N. Y.

Drafting Instruments

C-Thru transparent rulers, triangles, and other drawing and computing instruments are described and illustrated in a catalog of the C-Thru Ruler Co., 385 Capitol Ave., Hartford, Conn. Coordinate squares, various types of protractors, angles, conversion rules, slide rules, and various engineering scales are included. Mention this notice when requesting the folder.



TUNE IN THE
TEXACO STAR THEATRE
WITH JAMES MELTON
SUNDAY NIGHTS—
METROPOLITAN OPERA
BROADCASTS
SATURDAY AFTERNOONS



TEXACO

Notes on the Disposal Of Surplus Property

Following transfer of the Office of Surplus Property from the Department of Commerce to the Reconstruction Finance Corp. on November 5, the RFC organized the War Assets Corp. as its subsidiary to handle all surplus coming under its jurisdiction. The new unit will handle about 93 per cent of all surplus property, including consumer goods, in which classification construction machinery is to be found.

Surplus Property Administration officials said recently that orders from priority organizations (Federal, state, county, city governments, and others) would probably take up all the estimated \$12,000,000 worth of new construction equipment declared surplus.

Repair parts, many of which are not for general usage but for special war applications, form one of the SPA's greatest headaches. Large quantities of these spare parts are on hand, and more are expected to be labeled sur-

plus. The SPA has appealed to manufacturers for recommendations relative to their disposal.

Under the Surplus Property Act, Federal, state, county, and municipal governments and other specified organizations receive priority for the purchase of surplus property. These groups file their orders with the proper disposal agency, and as the requested property becomes available, it is set aside for them.

Cutting-Tool Catalogs

Tool holders, cutter bits, cut-off blades, and tool sets are illustrated and described in bulletins available from Armstrong Bros. Tool Co., 334 No. Francisco Ave., Chicago 12, Ill. Catalog CA-645 covers the Armstrong CA tool holders and sets, and Armaloy cutter bits and cut-off blades. The CA tool holders feature a greatly increased bearing area in the clamping screw, provided by a large heavy tool steel gib movably set between the screw

point and the cutter. Armaloy is an improved cast-alloy cutting steel with a hardness between that of the high-speed steels and the sintered carbides.

Armstrong carbide tool holders, described in brochure C345 are drop-forged from a special-analysis steel for use with carbide-tipped tool bits. Highly adaptable, they are built for strength, rigidity, close-up support of the cutting edge, and a flat cutting angle. They are made in six sizes, with either straight shank or left or right-hand offset. Armide carbide-tipped cutters are available in two grades, red for steel cutting and gray for cast-iron and non-ferrous machining. They are available for use with square or heavy-duty holders of the left or right-hand type, and have either square or 80-degree noses. Turning cutters and tool sets of Armide bits are also described.

Copies of either or both of these Armstrong catalogs may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Modern Highway System For Jap-Ravaged Manila

Plans Formulated in Concentration Camp Would Expand System, Build New Bridges, and Revamp Sewerage

* RAVAGED by the Japanese invader and practically demolished by American and enemy bombing, Manila, probably the most beautiful city in the pre-war East, sees in her misfortunes an opportunity to rebuild herself as a bigger and better metropolis, John M. Beard, Senior Economic Analyst at the U. S. Consulate there, says in a recent article in *Foreign Commerce Weekly*.

The city's extensive destruction and subsequent liberation have facilitated the formulation of well considered reconstruction plans which take into account the requirements of business, industry, and government, in addition to providing better living conditions for the population. Bridges are to be built or rebuilt at new locations, streets widened, highway systems begun, and many other improvements put through in the overall city plan.

In June, President Osmeña, who had become interested in civic planning while Vice President of the Commonwealth before the war, approved an overall plan for key boulevards and bridges, around which the new metropolitan area is to be constructed. However, the idea of rebuilding the city pre-dated the war, for on taking office in 1935 President Quezon inaugurated the plan of moving the Government center to a new site a few miles northeast of the city. This program was enlarged to embrace a master plan for the entire city, in which old landmarks were to be preserved in an orderly, clean, modern community.

Brought to Manila in 1939 to be National Park Commissioner, Louis P. Croft was interned at Santo Tomas during the Japanese occupation. While there, he spent much of his time developing city planning ideas, enlisting the aid of civic-minded persons in drawing up his program. From this grew the present proposed plan, which is so extensive that as long as 50 years is believed needed to complete it.

Outline of Plan

Under the general plan for rebuilding Manila, such historic places as the Intramuras or Walled City, which contains among other famous sites the oldest university under the Stars and Stripes, Santo Tomas, which the Japs used for one of their concentration camps, would be restored and set aside as a possible recreation area. The program calls for first laying out the main thoroughfares by broadening certain streets and avenues and widening existing bridges and approaches. The Public Works Department is at present carrying through an 18-month program to this end.

The Pasig River which cuts the city in two is of chief consideration in planning the new Manila. An adequate number of spans must be provided to meet transportation needs. Present considerations call for eight, or double the four prewar bridges. The Jones and Quezon bridges, widened to 50 meters (about 160 feet), are to be rebuilt at approximately their present locations.

Three new spans will be constructed. One will cross the Pasig at its mouth, linking the port area to North Harbor, abutments for which were built before the war. Other bridges will be erected near the San Miguel and Pandacan churches, and three upstream from the present Manila Railroad crossing at Pandacan. Probably only one permanent structure, that furthest upstream, will be needed immediately. Recon-

(Concluded on next page)

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OPEN**

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GET these important benefits . . . assure fewer repairs and replacements, longer and more trouble-free service between overhauls, better performance at lower cost . . . by lubricating your air compressor with *Texaco Alcaid*, *Algol* or *Ursa Oils*.

Texaco Alcaid, *Algol* and *Ursa Oils* are products born of many years of intensive research by The Texas Company in the field of air compressor lubrication. They are made from carefully selected crudes. The lubricating fractions are processed by modern Texaco methods in one of the world's largest refineries under the constant supervision of trained Texaco technicians. This is your assurance of uniformly high quality no matter where you buy them.

Texaco Products and Lubrication Engineering Service are available through more than 2300 Texaco distributing plants in the 48 States. Contact the nearest one, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels
FOR ALL CONTRACTORS' EQUIPMENT

Modern Highway System For Jap-Ravaged Manila

(Continued from preceding page)

struction of a number of minor spans will also serve to facilitate cross-river traffic.

Many New Thoroughfares

Two north-south routes crossing the heart of the city, five circular thoroughfares forming partial rings around the heart of the city, and seven radial routes emanating from the west-central part of Manila to the north, south, and east, and intersecting the circumferential highways, are included in the master street plan.

Dewey and Taft Boulevards, both of them north-south roads, are to be extended. The former will cross the projected bridge at the Pasig's mouth and continue south to Cavite, as planned for several years. North of the river it will be a broad thoroughfare along the North Port waterfront. Taft Boule-

vard will cross the Pasig on the Jones Bridge. Calle Rosaria, which forms the north approach to the bridge, will be widened and extended to form one of the main business streets in the city.

Heavy traffic will travel on express routes paralleling the railway, through the city, and across the bridges to be built near Pandacan church. This will be the introduction of this type of highway to Manila, which is also to get one of the first parkways in the Philippines. As one of the city's proposed seven radial routes, this new highway will form part of a boulevard running along the south bank of the Pasig. Both banks of the river are to carry boulevards from the mouth to Fort McKinley, 12 miles east of the heart of Manila.

Other Improvements

Commercial districts will probably rise out of the old slums near the river. Modern sewage and drainage facilities are to be introduced. Plans provide for covering the "esteros," unsightly and unsanitary open waterways or tide-

water creeks used to carry off surface drainage.

Expenditures Planned

At present, reconstruction and rehabilitation in the Philippines call for the expenditure of some 300,000,000 pesos (about \$150,000,000), as provided by two bills awaiting passage in the

Islands' Legislature. Almost all of this amount is earmarked for public works, including the construction, repair, and maintenance of national and provincial highways, new school buildings, and new government buildings. The other bill would provide 22,000,000 pesos for the construction, repair, and maintenance of irrigation systems.

MEMO

*Re: SNOW REMOVAL
Looks like Haiss High Capacity
Loading is the answer to our
snow problem, too. H.L.P.*

The Haiss Model 75W Snow Loader digs . . . breaks-up and loads wet, dry or frozen snow at better than 10 yds. a minute. Clutches and gears in oil bath cannot freeze.

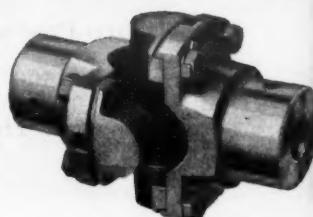
HAISS

Catalog on request
GEORGE HAISS MFG. CO., INC.
Canal Place & E. 142nd St.
New York 51, N.Y.

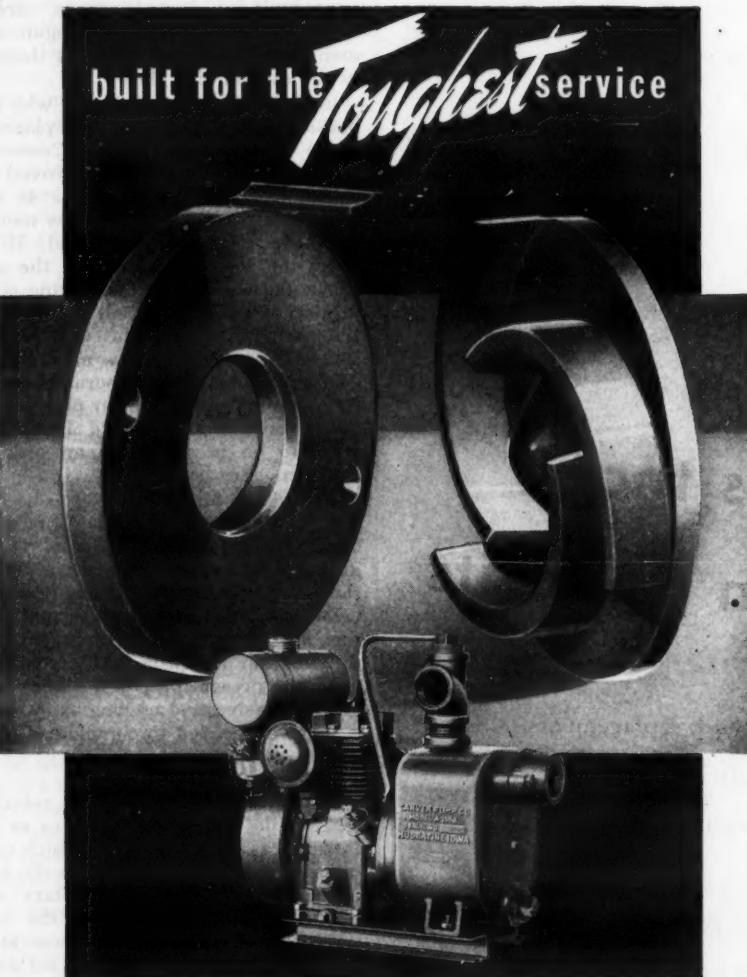
MECHANICS
Roller Bearing
UNIVERSAL JOINTS

Work Well In All Temperatures From Arctic Cold to Desert Heat

Whether your product is an arctic-chilled snowplow or a desert-parched bulldozer, it will operate more reliably and with less time lost for servicing if it has the lifetime or once-a-season lubrication feature of MECHANICS Roller Bearing UNIVERSAL JOINTS. Let our engineers show you how the right size and type MECHANICS joints will benefit your new or improved product.



Mechanics Universal Joint Division
BORG-WARNER CORPORATION 2026 Harrison Avenue Rockford, Illinois



● Every feature of Carver Pumps is designed to withstand the toughest operating conditions. Impellers are scientifically designed with web-reinforced vanes confining wear to one side. Renewable liners carry a cast lug protecting the scroll casing at the impeller cut-off where wear is greatest. Both parts are cast from special alloy and ground to close tolerance to keep performance high. When wear eventually occurs, their quick, low-cost replacement makes the pump as good as new.

THE CARVER PUMP CO.
Muscatine, Iowa

**CARVER CENTRIFUGAL
Certified PUMPS**

Quarry and Crusher Operated Under Fire

Penetration Paving With Emulsified Asphalt Used Hard Rock for Runways On Iwo Jima

By RAYMOND P. DAY, CCM, USNR

(Photos on pages 48 and 49)

IN order to make use of native materials in the most effective way, which is something the Japanese never learned to do at Iwo Jima, Seabees and Army Engineers have been crushing rock, laying it down in courses, and spraying it with controlled amounts of emulsified asphalt. This kind of penetration paving is rapidly placed, it handles fighter-plane traffic excellently, and it took the load off the hot-mix asphalt plant on the island, which was operated at peak capacity, batching asphaltic concrete for the bomber strips.

The paving job combined two activities: the rock-crushing operations, and field work at the airport. Each phase was equally important. Both operations were carried out in spite of innumerable difficulties, and sometimes under enemy fire.

When Iwo Jima was invaded by our forces in February, 1945, preliminary photographs had indicated that the island was solid rock. Seabees arriving there were fully prepared to do a hard-rock job. Actually, the cores of two volcanoes on Iwo contain hard igneous rock, but much of the topsoil was found to be bedded volcanic ash, permeated with sulphurous gas. Our engineers soon found out that when this material was excavated, pulverized, and processed, it made a tricky subgrade which was not nearly as foolproof as the coral base-course material farther south.

The Japanese engineers had never been able to cope with it successfully. They had to hew 8-inch-square chunks of rock out of the mountains by hand, place them laboriously in somewhat the same manner riprap is laid on river levees, and cover them with makeshift surfacing. The resulting runway was dangerously rough and permeable. Stronger subgrade development was definitely indicated for runways, fueling loops, taxiways, and hard-stands.

So the Seabees were unloading rock crushers long before the island was secured.

Taking Out the Rock

Near the north end of Iwo, andesitic lava rock outcrops all along the beach line. The cliffs are sloping, with a 300-foot elevation differential in a distance of 1/4 mile. The beach is covered with black lava-rock boulders, ranging from 2 to 20 inches in diameter. They are weathered and round from rolling and grinding against each other in the sea for a hundred centuries.

Rock-processing machinery was moved to this location and set up. Other Seabees were opening up a 30-foot quarry face. At night the Japs came out of their caves and watched them.

The Seabees had to build access roads down to the quarry and plant through enemy territory. They would have been difficult to build anywhere. The face of the cliff had to be cut down. Roads which were back-bladed by a bulldozer late in the day proved the enemy was close. "The roads were so full of split-toed Japanese tracks the next morning that they looked like tennis courts!" said plant foreman Douglas Davis.

The Nips hid by day in the caves. Once in a while they took a shot at a Seabee but missed. They put holes in some of the equipment and made a general nuisance of themselves until finally

the Seabees sealed the nearby caves with part of the limited supply of dynamite. One night two Japs peeped over the edge of a cliff to watch a Northwest shovel at work opening up the bottom of that hill for future drilling. They became so interested in their "sidewalk superintending" that a roving Army patrol sneaked up and captured them.

The rock is a very hard abrasive andesite. A small amount of tufa has also been identified. It has not been classified any finer than that up to the present time. The Seabees found that it drilled hard, wore out bits abnormally fast, and behaved peculiarly under the action of explosives.

The formation was progressively seamed towards the surface by cooling cracks, and the pieces interlocked like



U. S. Navy Photo
At a Seabees' rock-crushing plant on Iwo Jima, an Allis-Chalmers tractor with dozer spread processed material from the end of the conveyor over the stockpile.

a jigsaw puzzle. A Northwest 2-yard shovel would not budge this material without benefit of blasting. Out of the hardships of the first few weeks the Seabees prudently adopted the only

scheme that would get this stone loose from the mountain. They opened up a section of rock until they had developed a face approximately 30 feet high. Four

(Continued on next page)



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Quarry and Crusher Operated Under Fire

(Continued from preceding page)

Model FM-2 Ingersoll-Rand wagon drills with two 500-cfm compressors were brought in. Every 40 feet along the base of this cliff the wagon drills, using 22-foot steel and detachable Jackbits, sank three holes. One hole was drilled on a 20-degree slope down towards the quarry floor; one was pushed in horizontally; and one was sloped upwards on about a 30-degree angle. All three holes were made on the same drill set-up. In relation to the rock face, they were well concentrated towards the bottom of the quarry.

In drilling these holes, the Seabees found that a rose-type Jackbit worked best, giving faster penetration. Only 6 linear feet of hole would dull a bit and cause it to lose up to $\frac{1}{8}$ inch of its gage. The bits were resharpened on an Ingersoll-Rand Type IR-34 sharpener. After five sharpenings, a bit was so worn that it had to be discarded.

The machines drilled an average of 12 linear feet of hole per hour, with the best hourly drilling footage being 22 feet. Four diminishing sizes of bits were used in drilling a 22-foot hole. "Normal wear took care of bit sizes", said Lieutenant M. B. Kite, CEC, USNR, who was in charge of the rock quarry and crusher. "We just ordered 2½-inch bits and we certainly didn't have to drill far before most of them were smaller."

The holes were loaded to within 2 feet of the face of the cliff with 60 per cent gelatin, and set off with a No. 6 electric blasting cap in each charge. Delays were used on the top shots, but for the most part all shooting was instantaneous. The rock above the charge, which ordinarily could not be moved by a power shovel, needed only this kind of jarring undermining action to bring it tumbling down. The pieces were remarkably uniform, due to the surface cooling cracks which meander through the formation. No piece was ordinarily greater than 18 inches, with smaller rock in proportion.

It was loaded out to a fleet of ten assorted dump trucks of 2½-yard capacity by a Northwest Model 6 shovel swinging an Amoco dipper. About 1,200 tons of rock left this quarry per 20-hour day.

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Prior to the initial operation of the quarry, the Seabees worked in the middle of a mine field. The need for crushed rock had been so urgent that they started feeding the crusher with beach rock dipped out of the natural deposit at the water's edge. The beaches had been so viciously fought over, however, that the rock was loaded with unexploded ordnance and bits of shrapnel. Please don't ever try to tell a Seabee from Iwo Jima what destruction shrapnel can cause in a roll crusher. He knows!

There was so much of this steel that they tried to make an electromagnet to pick it off the conveyor belt. That failed to work because the magnet had to be placed too close to the belt, causing the rock to ball up under it, damaging the belting. The only way to handle the problem was to assign a steel picker to throw steel off the belt where it led up to the roll crushers. This man's job became easier when rock began coming out of the quarry, but then the rock was so plentiful that they had to use

this extra man on the plant all the time.

If for any reason the quarry output was too low, or it was halted temporarily, the Seabees moved one of the shovels down to the beach, which by then had been cleared of land mines, and kept the plant running from the original source of supply.

Rock-Crushing Plant

In traveling through the rock-processing plant, the rock passed through these stages, or steps:

1. The rock was end-dumped into a gravity-type feeder hopper 12 x 16 x 4 feet deep, set above the primary crusher. This feeder held three full truck-loads. The rock was fed to the primary crusher by a controlled grizzly feeder belt, set at a 1-inch opening between bars. Any minus-1-inch rock passed through these openings.

2. A Pioneer 36 x 42-inch primary jaw crusher set at 3½-inch clearance, and powered by a 6-cylinder Waukesha gasoline engine, reduced all the rock to minus 3½-inch. It then passed on to

a Pioneer 30-inch conveyor belt 40 feet long, driven by a Wisconsin gasoline engine, and was dropped into a "splitter bin", the purpose of which was to separate the rock into twin identical quantities.

3. After being divided in the splitter bin, the rock dropped through separate chutes to two Universal 18 x 30-inch jaw crushers set at 1-inch clearance. These crushers were powered by Twin City gasoline engines. The plant was a double set-up all the way from this step.

4. Each jaw crusher discharged to a 24-inch conveyor belt, which took the rock in identical quantities up to a pair of Universal roll crushers, set at ½-inch clearance. These crushers were also driven by Twin City gasoline engines.

5. Rock then passed, by means of a bucket elevator, to a Simplicity double-deck gyratory screen with 48 square feet of screen surface. The first deck of this screen was covered with 2-inch wire mesh; the lower deck with 1-inch

(Continued on next page)

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Quarry and Crusher Operated Under Fire

(Continued from preceding page)

mesh. These screens were driven off the roll crushers by a 3½-inch flat belt. The rock was so abrasive that the wire-mesh cloth in the gyratory screen wore out and had to be replaced every two weeks.

Plus-2-inch rock was bypassed back through the roll crushers. The crushed rock from 1 to 2-inch passed into the subgrade-material section, and finer rock from 1-inch down was taken off another conveyor and stored for asphalt-plant use in an adjacent pile. About 25 per cent of the crushed rock reached the plus-1-inch stockpile, with the crushers set at the clearances given. In loading crushed rock to the trucks, that rock where the two piles joined was always sent to the airfield sub-grade.

An Allis-Chalmers HD-10 tractor bulldozed crushed rock away from the minus-1-inch-size conveyor, and an Allis-Chalmers HD-7 machine was used for the same purpose over on the 2-inch pile. Almost every ton of rock produced by the crushers was handled by these tractors, which without seeming busy accounted for moving some 1,200 tons of material about 150 feet in each 20-hour running period.

Devotion to duty was the rule rather than the exception around this plant. The HD-10 tractor-bulldozer, manned part of the time by its Seabee operator, worked on the front lines for a week with the 4th Marine Division, knocking out Japanese pillboxes. It has holes in it to verify the accuracy of this information.

When one of the Twin City gasoline engines on a roll crusher broke down, the Seabees found to their dismay that no spare valves were on hand to fix it. Not a Twin City valve was to be found in that part of the Pacific, as a matter of fact. But a Seabee mechanic, H. G. Porter, MM1/c, refused to consider himself whipped. He took Ingersoll-Rand compressor engine valves, turned them down to Twin City size, and the crusher was operating at capacity again exactly 16 hours after it broke down. Porter had to work nearly all night to do this job.

The Seabees had, in addition to the equipment mentioned, a Northwest Model 25 shovel and a Barber-Greene bucket loader for loading crushed rock to dump trucks; a Worthington 210-cfm compressor for clean-up work around the plant; a Hobart arc welding machine; and a Caterpillar RD4 tractor for pulling wagon drills around in the quarry. All equipment was serviced with fuel at 7:00 a. m. and 4:30 p. m. daily. A grease truck carrying Alemite pressure units made the rounds at 7:30 a. m. each day.

Man-power was divided between the plant and quarry as follows:

Rock Plant, One Shift

- 1 Lieutenant, in charge
- 1 Ensign or Warrant Officer, Shift Superintendent
- 1 Chief Petty Officer, Foreman
- 1 Plant operator
- 1 Motor mechanic
- 4 Oilers
- 4 Rock-feeder operators
- 3 Engine operators
- 1 Steel picker
- 2 Welders
- 3 Laborers
- 1 Shovel operator
- 1 Loader operator
- 2 Bulldozer operators

Rock Quarry, One Shift

- 1 CPO, Quarry Foreman
- 6 Drillers
- 1 Shovel operator
- 1 Oilier
- 1 Bulldozer operator
- 1 Electrician
- 6 Truck drivers

Penetration Paving

By combining the crushed rock from this plant with emulsified asphalt, the Seabees produced a pavement which could be built rapidly, and successfully



U. S. Navy Photo

This Allis-Chalmers HD-10 tractor with Baker bulldozer took time out from its construction duties to knock out some Jap blockhouses. Seabees point to some of its battle scars. Later the outfit worked at the crushing plant.

carried fighter-plane air traffic.

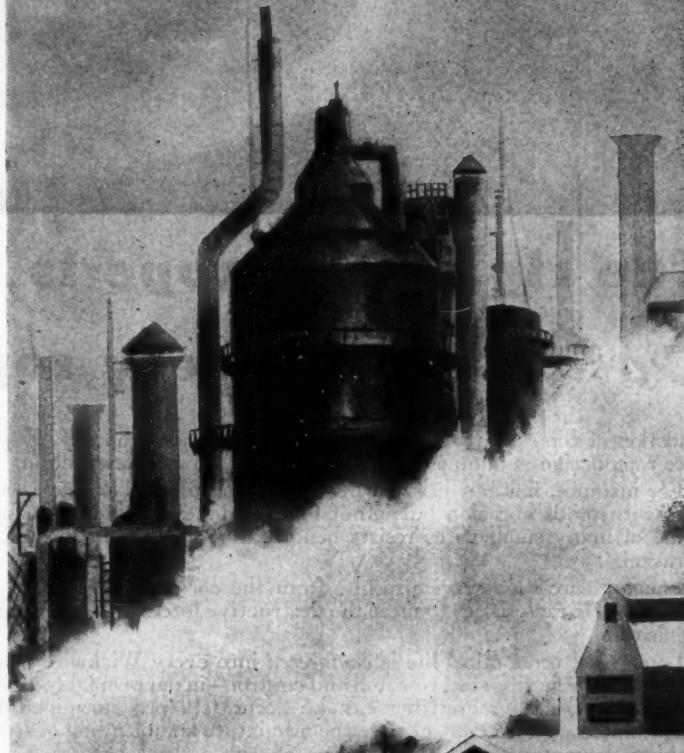
It was placed as soon as the earth portion of the subgrade was rolled and shaped to grade. The 1 to 2-inch stone was laid down by dump trucks in piles, and bladed to a uniform 2-inch thickness by motor graders. Centers of the piles were figured on the basis of volume to produce the prescribed thickness of rock. This 2-inch layer of rock was then rolled by a 5-ton Buffalo-Springfield tandem roller to bed the rock down in the earth. Sometimes, when it was very dry, sprinkler trucks laid a salt-water spray down over the ground just ahead of the rock blanket.

The 2-inch rock blanket was then shot with 0.5 gallon of emulsified asphalt per square yard. The asphalt came to Iwo in 52-gallon steel drums, was dumped in a transfer vat, and pumped to 1,000-gallon distributors.

A layer of torpedo gravel, which was actually crushed rock from $\frac{1}{2}$ to $\frac{3}{4}$ -inch from a special crusher, was laid down 1 inch thick on top of the 2-inch

(Concluded on next page)

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Quarry and Crusher Operated Under Fire

(Continued from preceding page)

blanket. After being rolled and bedded, this layer was tack-coated with 0.3 gallon per square yard of the same 50-50 emulsion. A No. 4 rock-dust blot coat was then applied, compacted by a steel-wheel tandem roller, and the excess material swept up by tractor-powered brooms to be used over. This blot coat made the airfield available for use after it had cured about 24 hours.

Because the operations were strung out to include these many steps, no accurate speed records of finished paving could be achieved. Broadly speaking, however, the Seabees and a few Army Engineers finished a 6,000-foot fighter strip and opened it up for traffic in 30 days.

The finished penetration paving is fairly dense, and shows no indication of "raveling". It has handled fighter planes by the hundreds. The number of sorties being flown off the Seabee-built fields was still censorable when this was written.

Personnel

This work was done under the general direction of Colonel D. A. Morris, AAF, Island Engineer. Commodore Robert C. Johnson was the Officer in Charge of Iwo Jima's Naval Construction Brigade, with Commander Paul Henderson, CEC, USNR, directing the activities of the regiment doing this job.

Airport Expressway Planned for Chicago

An air terminal capable of 360 plane movements per hour is to be built near suburban Park Ridge, Chicago officials have announced. To cover an area of 5,235 acres, the port will be located northwest of the metropolis at the site of present Douglas Field.

Coincidental with the selection of the airfield site, Illinois, Cook County, and Chicago engineers announced plans for financing and building a \$50,000,000 expressway to serve the area northwest of the city. Originally scheduled for the more distant future, construction of the highway has been advanced because of the air terminal.

Developed during the war as a factory and testing area, Douglas Field occupies 1,400 acres, with runways and factory buildings. The City of Chicago has priority on its purchase under the Surplus Property Act. Selection of this site followed the report that \$80,000,000 to \$120,000,000 would be needed to build an air terminal on the Lake Michigan waterfront.

As proposed, the 5,235-acre airport will have twelve tangential runways built in pinwheel form around central administrative and loading facilities. Eight of the runways will be 6,150 feet long, and four, 7,700 feet. If it becomes necessary, some of these may be extended to 17,000 feet.

The new airport is expected to cost \$40,000,000, somewhat less than half that of Idlewild in New York. This sum includes \$5,000,000 for the purchase of land, and the removal of obstacles. Part of the necessary construction funds are already at hand, as a \$15,000,000 bond issue was approved by Chicago's voters last June, and the State has promised some aid.

Underwater-Cutting Electrode Brochure

A four-page bulletin describing Ellpro cutting electrodes for underwater or surface cutting has been published by the Ellwood Products Corp., Ellwood City, Pa., and is available, on mention of this notice, to all readers of CONTRACTORS AND ENGINEERS MONTHLY.

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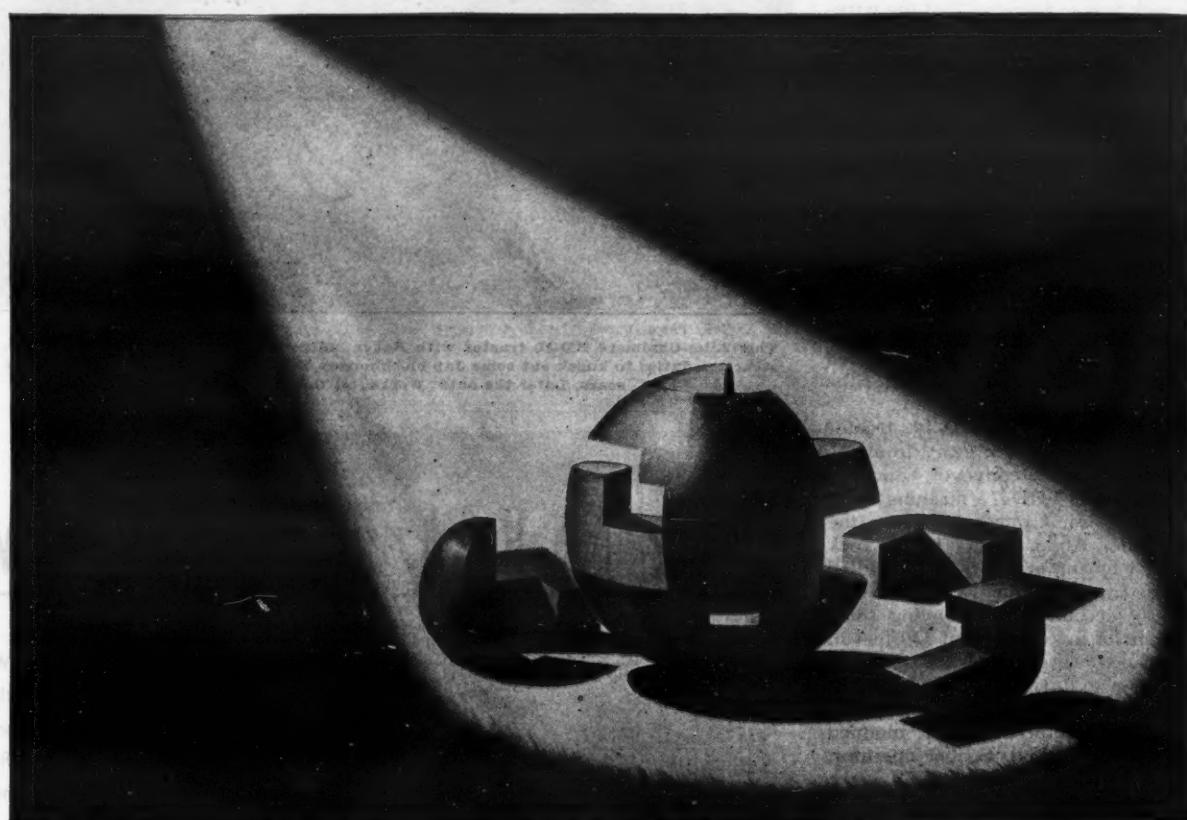
speedy cutting with the Ellpro cutting electrodes, the brochure says, describing the various steps in the operation. Illustrations of the electrode in use under water and a "burn-off" chart are presented. The Palmgren Arc-Oxygen Kit, designed to simplify the cutting of steel under water on construction or salvage jobs, is also described.

Diesel Lubrication Book

A new booklet, "The Lubrication of Automotive Diesel Engines", is offered by the Gulf Oil Corp. as a guide for operating men. Among the subjects covered are a review of the fundamentals of the diesel engine, the lubricating and cooling functions of oil, the selec-

tion and proper care of lubricating oils, tests applied to lubricating oils, engine tests, and diesel fuels and their combustion.

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PERFORMANCE

Emphasis on Economy In Roadside Projects

Review of Factors Reducing Maintenance Costs; Types Of War Memorials; What About Old Roadsides?

NOW that peace and the post-war era of highway construction are here, roadside development, which during the war was cut to a minimum due to shortages of man-power and equipment, once more will be given its rightful place in our planning for the construction of new highways and the maintenance of old ones.

It has often been stated that the basic fundamentals of roadside development promote the factors of utility, safety, beauty, and economy essential to the development of a "complete" highway. In the "better world" which we have fought to secure, there is certainly a place for aesthetic values, but in the last analysis roadside development must contribute to economy of maintenance if we are to justify the expenditure of time and money on this phase of our highway program.

The roadside-development items which contribute most to reducing maintenance costs are the subject of a paper by H. J. Neale, Landscape Engineer, Virginia Department of Highways, in the 1945 Proceedings of the Southeastern Association of State Highway Engineers.

Erosion and Drainage

It is pointed out by Mr. Neale that the roadside-development items most affecting economy can be divided into two groups, those that can be measured directly in dollars and cents and those that have hidden or indeterminate values. Generally speaking, roadside development involves the protection and rehabilitation of earth surfaces by vegetation. It therefore includes shoulders and ditches as well as roadside areas, as eroded soil from cut slopes chokes ditches and culverts and causes shoulders, and at times entire roadways, to wash out. Many major slides and surface slips have started with surface erosion.

Where slopes are flattened and rounded to a streamlined cross-section and covered with turf, the run-off of surface water is retarded. Much of it is retained by the soil, and the superfluous water enters the ditches or gutters clear instead of filled with silt. The same condition prevails on steeper slopes that cannot be economically flattened and turfed, but where coarse ground covers protect the surface against erosion. Most careful consideration must be given to the type of vegetation used, however. Coarse, rapid-growing, succulent grasses and legumes require more costly mowing than the lower-growing, closely knitting species; therefore the latter should be given preference. Mowing can be a costly drain on maintenance appropriations, but modern equipment combined with flat uniformly turfed slopes can reduce this to a minimum. It is

purely a matter of comparing mowing costs with the cost of cleaning ditches and culverts and regrading shoulders after every heavy rainfall to determine to what extent turfing or planting of other vegetation for soil protection is justified. Flat turfed slopes not only contribute to more economical mowing but eliminate a great deal of snow drifting, reduce fatigue to the driver, and add immeasurably to the safety and beauty of the road.

Many fills have been washed out during high-water periods merely because the lower surface of the fills was not riprapped or protected by vegetation. Rough vines, the roots of willows or other trees, and the hardier shrubs or Lespedezas are excellent for this purpose.

Streamlined or swaled gutters promote fluid run-off, do not block easily, and are usually self-cleaning. Whether these should be paved by turf, soil-cement, or otherwise depends entirely upon existing conditions and the amount of water they will have to carry. The important consideration is that they should be stabilized to protect the shoulders, as well as the cut slopes, in the most economical and at the same time permanent manner.

Turfed shoulders eliminate surface erosion and the resulting choking of ditches, furnish better road-edge visibility, afford safer parking, eliminate dust, and add materially to the beauty of the road. Here again, the selection of grass species to produce a compact low-growing sod will reduce the amount of mowing necessary.

Ground Cover

The development of turf and ground cover on road slopes does not always require topsoiling. Many subsoils can be changed into fertile areas by the use

of fertilizer, lime, and mulch. Mulch alone on slopes will materially reduce erosion by eliminating or breaking the erosive force of heavy rainfall. This is especially true on clay soils which are also susceptible to baking or sealing-over during dry seasons and then absorbing water and creating slides when they become super-saturated during extensive wet spells. Mulch reduces heaving and slipping of soil surfaces during spring thaws. It also prevents or greatly reduces wind erosion. Where sufficient funds are not available to topsoil, fertilize, seed, and mulch, and thus produce a compact turf, mulching alone will save many maintenance dollars. This process will eventually change the soil texture and develop a loam or fertile topsoil and supply food for soil bacteria which will promote a natural vegetative cover over the area.

Selective thinning and grubbing of roadside trees and shrubs can contribute immeasurably in promoting safety and building beauty into roadside.

(Continued on next page)

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Emphasis on Economy In Roadside Projects

(Continued from preceding page)

sides. Careful clearing of undesirable growth in roadside woodlands will eliminate continual brush cutting and give permanent trees and shrubs an opportunity to develop naturally. In time these areas will need only minimum maintenance.

Roadside War Memorials

There will undoubtedly be many opportunities on highways for the location of various types of war memorials, by the planting of trees, or in the development of memorial waysides, overlooks, vista parking areas, intersections, interchanges, et cetera. The reign of monuments in stone or bronze and of the camouflaged cannon, machine gun, and mortar is of the past and especially so on highways. The demand for more landscaped or tree-planted highways and for more casual picnic-table spots and waysides will undoubtedly prevail in the future. Many of these features can serve in a dual capacity, as memorials and utilities. Highway engineers should give most careful attention to the selection and design of these memorials, especially from the standpoint of maintenance, for this will be a continuing and permanent expense. These memorials can, therefore, be either assets or liabilities to a highway department, depending on their design, construction, and use.

Roadside trees are a welcome note on any highway. But whenever single trees are dedicated to individuals, there is a continuing responsibility to maintain them as such. All trees, even of the same species, do not grow and develop uniformly. All are doomed to die sooner or later, some much more quickly than others. To replace them in kind and size in a manner satisfactory to the family or friends of those so memorialized is practically impossible. On the other hand, when trees are planted in informal groups and these groups are dedicated as memorials to one or more, the responsibility is not so great because as the individual trees in the groups become diseased or die for one reason or another they can be replaced by smaller trees, thereby perpetuating the grove effect and the me-

morial as a whole.

Waysides and other roadside recreation or parking areas offer exceptional opportunities as memorials, if developed in a natural manner suitable to their surroundings and use. They add immeasurably to travelers' use of roadsides and to traffic safety. They furnish opportunities for travelers to stop, rest, and relax under safe conditions, thereby avoiding fatigue to the driver. These areas also contribute to the beauty of the highway when appropriately landscaped. Although these may increase maintenance costs, especially if they were so designed and developed to require intensive care and constant attention, they may be embellished in a natural manner in keeping with their surroundings, and their maintenance minimized so that the cost value can be measured in direct proportion to their use by the public. Intensive and regular use of a wayside should be ample justification for adequate appropriations to keep it in a neat and orderly condition at all times.

Roadside Planting

Roadside trees and flowering shrubs, when properly located, relieve monotony and promote safety by reawakening the interest and attention of drivers. They can also be of added service by increasing target values to traffic signs. In some cases, their mere presence, without traffic signs, indicates the nature of the location; three or more formally located trees would be indicative, in many instances, of a school, church, other public building, residence, or even an entire community. Formal rows of trees admirably portray both horizontal and vertical curvature, as well as intersecting roads. Trees and shrubs add to the protection of ditches, culverts, head walls, bridge approaches; et cetera. While the care of these trees and shrubs might increase maintenance costs, this cost can again be compensated for in their values to safety and utility.

Nature, being endowed with self-perpetuating powers, should be utilized to its fullest capacity wherever possible.



"Stop worrying about dangerous depths! Am I asking you to do anything that I wouldn't do?"

Native vegetation is usually more susceptible to adjusting itself to soil and climatic conditions than introduced plant material. The first consideration should be, therefore, to effect the best

(Continued on next page)



PORTABLE PLANTS

Austin-Western Portable Crushing and Screening Plants are made in a wide variety of types and sizes; each complete with whatever is required in the way of conveyors, screens and bins.

• Key to the successful and profitable operation of any plant is the crusher itself... reason enough for the painstaking engineering behind every Austin-Western jaw and roll model.

Exclusive features increase output, assure constant operation and reduce maintenance costs.

The same skilled engineering characterizes each and every Austin-Western crushing and screening plant, from the most simple to the most elaborate; each tailor-made to the requirements of a particular production problem.

**AUSTIN-WESTERN COMPANY,
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TWO-UNIT AND THREE-UNIT PLANTS

Suitable for either pit or quarry use, these plants are capable of delivering highest tonnages of aggregate in accurately controlled sizes. Frequently, each unit is capable of producing material that

meets job requirements, in which case the individual units can be used separately as shown in the photographs above. Such flexibility of operation spells maximum profits for the owner.

Buy METAL SIGNS Now!

Widely used CATAPHOTE Metal Reflector and plain Signs now available...for all types of traffic-control messages. Long-life, low-cost illumination assured by use of Cataphote Reflector Buttons...for day-and-night effectiveness! No moisture condenses...no yellowing with age...brilliance guaranteed 3 years. Check your needs—order today!

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TOLEDO, OHIO



AUSTIN **WESTERN** **COMPANY**
MANUFACTURERS OF ROAD MACHINERY



**BUY MORE
WAR BONDS**

Emphasis on Economy In Roadside Projects

(Continued from preceding page)

cross-section from standpoints of safety, drainage, and vegetative control and then select the grass, ground cover, or other plant material that will perpetuate itself with the least maintenance expense.

A Part of Road Design

The most economical and appropriate time to incorporate these protective measures is naturally in the design and during original construction. Excavation obtained from flattening and rounding of slopes can be balanced at that time while when done under maintenance it usually has to be wasted unless it can be used to flatten fill slopes. This type of work creates traffic disruption once a road is open. There are innumerable opportunities to salvage topsoil on new construction projects that do not prevail afterward. The immediate covering of newly laid slopes with mulch or vegetation protects the surface against erosion, while the stabilization of ditches eliminates scouring and at the same time protects the toe of the slopes. Wherever the highway investment and maintenance funds are a consideration, every means should be used to protect them. There is no better way to make money than by saving and properly investing it. Funds invested in slope and drainage controls by vegetative processes have paid and will continue to pay big dividends.

Mr. Neale's paper concluded with the summary that the roadside-development items which contribute most to the reduction of maintenance costs are those that eliminate erosion, provide more adequate drainage, and incorporate safety and utility features by natural instead of mechanical means.

Problem of "Old" Highways

In a discussion of Mr. Neale's paper in the same issue of the Proceedings, Frank H. Brant, Landscape Engineer of the North Carolina State Highway and Public Works Commission, brought up the interesting point of which of these items of roadside development should be included in a program of maintenance on the older highways, and to what extent they are justified. In many cases, Mr. Brant said, highways are modern as far as location, alignment, grade, and right-of-way are concerned, and "old" only along the roadside, with bare shoulders, gullied ditches, and steep eroded slopes. On such sections of highway where there is reasonable assurance of permanence, a rather extensive program of erosion control could be justified from the economic standpoint of reduced maintenance costs.

It would be worth flattening all cut slopes, except in the deepest cuts, to control erosion. It would be worth flattening the slopes of light fills to eliminate the continuing expense of guard rail. On that portion of the right-of-way that is to be mowed by machinery, a thorough roadside clean-up to free the area from stumps, snags, logs, and rocks will save a great amount of wear and tear on mowing equipment. A complete job of topsoiling (if needed), fertilizing, seeding, and mulching would give more rapid erosion control. Paving or sodding of gutter lines would soon pay for itself.

On the other hand, there are many miles of highways that are "old" in alignment and grade, as well as along the roadside, and in these cases it might be argued that no roadside work could be justified because all of it might be destroyed by future reconstruction or widening. But the forces of erosion pay no attention to such apparently logical reasoning, and maintenance costs

due to erosion stay high.

"Temporary" Measures

What temporary measures can be taken? Rounding of top edges of slopes to prevent sloughing overhangs could take the place of extensive slope flattening. Mulching alone with right-of-way cuttings could take the place of more expensive topsoiling, fertilizing, and seeding. Sowing seed through the mulch could replace more elaborate seedbed preparation. A brush treatment for a gullied ditch is a substitute for a regraded and paved or sodded gutter.

Mr. Brant suggested that perhaps the use of the word "temporary" is ill-advised. In many cases a new construction project will be on an entirely new location, and the present highway will remain in use as a secondary road. The forces of erosion pay no attention to whether a highway is on the primary or secondary system; so there is need for control of erosion on all roads, and the less elaborate and less expensive

methods described as "temporary" could be used in a maintenance program for the lesser roads which do not warrant the highest type of maintenance.

Gradual Achievement of Goal

Whatever steps are taken under maintenance, the important thing is to keep away from the idea that nothing can be done unless it is done as an ex-

tensive "project" and done all at one time. It is fine if extensive work can be done in any one year, but certainly it is not necessary. If these items of roadside development are kept in mind and applied gradually, the end result will be the same without an undue burden on maintenance. Roadside cuttings on a section of highway in one year may be sufficient to mulch only one cut

(Concluded on next page)

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No matter what the snow or ice conditions, you obtain FASTER • SAFER • CLEANER snow removal with the lighter, yet stronger, DAVENPORT-FRINK SNO-PLOWS. Available in "V" and Straight Blade types for all sizes of trucks, tractors, road patrols and locomotives. Once you see them at work, you know why they are engineer-preferred throughout the snow belt.

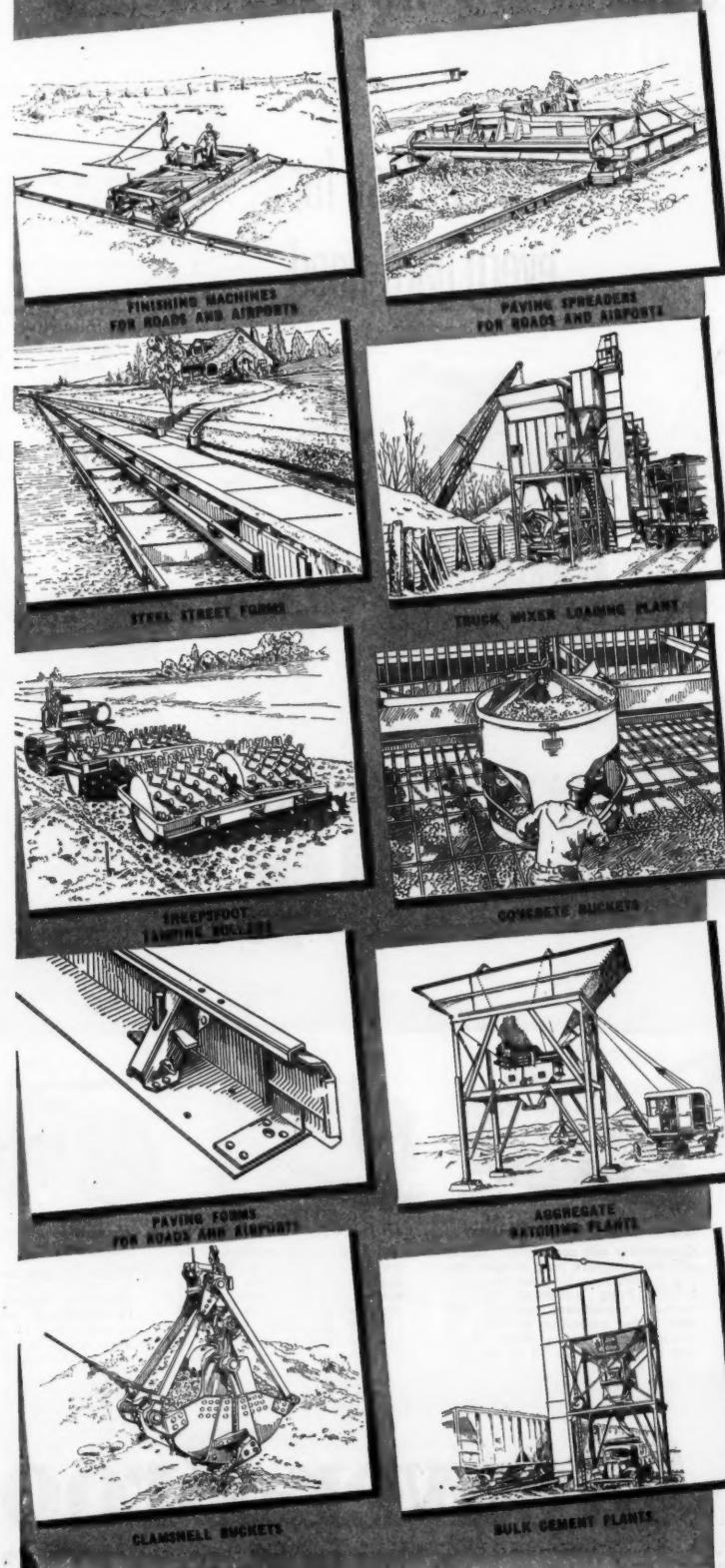
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Emphasis on Economy In Roadside Projects

(Continued from preceding page)

slope, but that small amount should be done that year, and at least that one slope will not be a continuing trouble-maker. Some borrow may be needed; get it by flattening a slope instead of gouging into it, and one more troublesome item gives less grief. Roadside-development principles can be made a part of everyday maintenance.

Responsibility to Community

One point in connection with roadside erosion is overlooked too often. There are places where raw, bare cut slopes are not a particular maintenance problem. Winter freezing and thawing cause loosening of the slope surface, but the topography is right and subsequent rains are sufficient to carry away the eroded material and keep ditches clean. Often a borrow pit or an abandoned section of the old road is left barren; the erosion from it does not bother the roadway. Yet all the time the eroded raw subsoil is being washed from the highway to silt up streams and damage bottomlands. Shouldn't the highway engineer consider the community as a whole in a matter like this?

The Mowing Problem

Some comment has been made about the high cost per mile for mowing wide grassed right-of-ways even though the swath-mile cost be low on flattened rounded slopes. In some agricultural areas, clean mowing may be necessary to prevent spread of weeds, but along the many miles where highways pass through wooded and waste land, why mow the entire right-of-way? An unmowed slope in front of a woodland may look slightly ragged, but is not out of place because it blends in with the natural raggedness of the woodland. In time, a woodland growth at the outer edges of the right-of-way will tend to keep down rank weed and grass growth.

A Word of Warning

A timely note of warning was sounded by Mr. Brant on the subject of war memorials. Emphasis on the points brought out by Mr. Neale's paper in regard to highway war memorials cannot be too great, Brant said. The publicity, the dedication ceremonies, and the speeches are the glory for the organizations sponsoring the memorials; afterwards, the headaches are those of the maintenance engineer.

Amphibious Tractors Converted From War

A sea-going tractor, used by the Army as an amphibious tank, is in the process of being converted to civilian design, and will prove useful to contractors and others engaged in flood control, levee building, swamp work, the disposal of materials removed in underwater excavation, and other operations.

Known as the Water Buffalo, the tractor, in its peacetime form, will have a maximum grade-ascending ability when unloaded of 32 degrees or 70 per cent. Loaded, it will ascend a 24-degree grade. Its grade-descending ability is 70 per cent. The machine makes 22 mph on land when loaded, and 5½ mph in water. It can turn a circle within a 20-foot diameter on land, and 50-foot diameter on water.

Measuring 25 feet 10 inches long, 8 feet 1 inch high, and 10 feet 8 inches wide, the Buffalo weighs 24,700 pounds unloaded. It has a cargo capacity of 12,000 pounds in a cargo area of 88 cubic feet. Potential cargo volume is 120 cubic feet. When loaded, its draft

is 54 inches.

The war-making Water Buffalo was powered by a gasoline engine which would prove highly expensive in peacetime operation. When standard models are produced for civilian use, either diesel or gasoline engine will be furnished. The Water Buffalo is made by the Food Machinery Corp., Riverside, Calif., from whom readers of CONTRACTORS AND ENGINEERS MONTHLY may obtain further details.

Gar Wood Purchases

Buckeye Ditcher Co.

Completion of the purchase of the Buckeye Traction Ditcher Co., Findlay, Ohio, has been announced by Gar Wood Industries, Inc., Detroit. The firm, which has acquired 92 per cent of Buckeye's capital stock, expects to expand operations at Findlay, shifting some of its manufacturing from Detroit.

The acquisition of Buckeye, a leading manufacturer of ditchers, rounds out Gar Wood's line of construction ma-

chinery, which includes dump bodies and hoists, truck and trailer equipment, truck and tractor-mounted winches and cranes, bulldozers, and scrapers. In

addition to ditchers, Buckeye makes power shovels, fine graders, chip and aggregate spreaders, bulldozers, and power control units.

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ELECTRIC PLANTS

NEW POST-WAR MODELS

350 to 35,000 watts A.C. and D.C.

Light, Safe and Portable
Sturdy and Compact in Construction
Modern in Design and Inexpensive
to Operate

These models have extremely high output for their size and weight. They are recommended for portable work on road and construction jobs, repair depts., fire depts.; indispensable for lighting and operating of electric tools such as portable compressors, drills, saws, sanders, etc.

Immediate shipment from emergency stock on many models. Wire us your requirements.

WINPOWER MFG. CO.

NEWTON, IOWA



-- at Low Cost for
every yard need

• Profitable, uninterrupted yard operation in cold weather calls for steam — hot water or heat — for many purposes.

- thawing and heating aggregate in stock piles or bins — for winter concreting.
- heating water for central mixing plants.
- heating asphalt, oils, bituminous material in tank cars or storage tanks.
- steam or hot water for cleaning machinery — heating offices and buildings.

Cleaver-Brooks automatic steam plants provide steam for every yard need — fast, dependably and at low cost. Where hot water is needed in quantity a Cleaver-Brooks hot-water booster fills the bill to perfection — provides 1600 gallons of hot water heated 150° F. per hour.

Write for bulletins and complete information on the entire line of Cleaver-Brooks equipment for cold weather construction and maintenance.

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Automatic Steam Plants

Completely self contained; highly efficient; require only simple piping connections to place in operation. Fully automatic fuel-oil burner; condensate recovery and feed water pumping system; no stack needed, sizes from 20 to 500 h.p.; pressures 15 to 200 lbs.

Hot Water Boosters

Oil-fired; fully automatic or manual operation; no licensed engineer needed; two capacity sizes: 3000 gals. storage tank for 1600 gals. of water heated 150° F. per hour; 1500 gals. storage tank for 800 gals. of water heated 150° F. per hour.

Portable Pumping Boosters

Heats bituminous material by direct firing in one operation, loading directly to distributor, relay truck or returning to tank car. Two sizes, truck mounting or 4-wheel trailer.

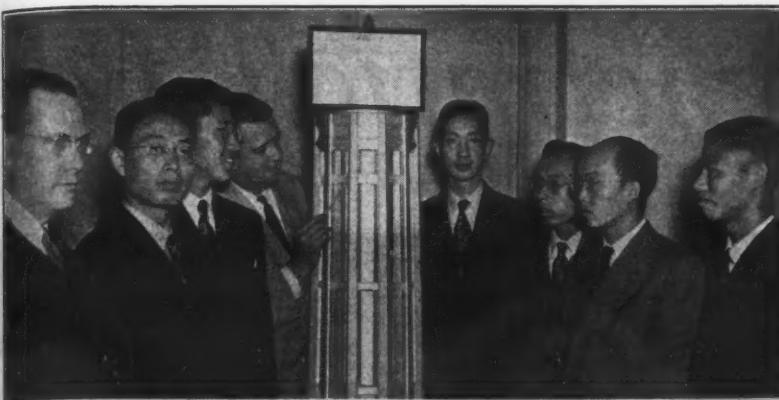
Portable Tank-Car Heaters

Available in 2 and 3 tank-car sizes. Oil-fired with exclusive four-pass flue travel; dry-coil steam condensate return under pressure — no water or heat loss. Provides a portable source of steam wherever needed.

Cleaver-Brooks

Pioneers and Originators of *TANK CAR HEATERS *BITUMINOUS BOOSTERS *AUTOMATIC STEAM PLANTS



*Bureau of Reclamation Photo*

Part of the group of twenty-five young Chinese engineers, in this country to study dams and power projects, meet W. E. Corfitzen, Acting Chief of Special Assignments Section, Bureau of Reclamation, (at left) and Assistant Commissioner of Reclamation Kenneth Markwell (at model of one of Boulder Dam's intake towers).

Chinese Study Dams In the United States

Preparing for an active role in the development of China, twenty-five young Chinese engineers, now in the United States to study American techniques and methods, have chosen as their "texts" the multiple-purpose projects of the Bureau of Reclamation. This training program is sponsored by the Chinese government with the assistance of the International Training Administration.

All graduates of Chinese universities, the members of the group hold engineering degrees with special emphasis on hydraulics. They have an average of about six years of practical engineering in China, and are between 28 and 33 years old.

After an orientation course in Washington, the young engineers will visit New York, Chicago, and the University of Iowa, before beginning an intensive training in the design, construction, and operation of irrigation and hydro-electric projects at the Bureau of Reclamation office in Washington and laboratories in Denver. They will be taught first-hand the techniques and skills employed by Reclamation engineers who designed the highest dam in the world, Boulder, and the largest concrete structure of its kind, the Grand Coulee Dam.

Contractor Manages Branch Truck Office

C. E. Hall & Sons of Somerville, Mass., one of the largest operators of trucks for construction purposes in New England, has appointed Kenneth L. Jones to the post of Division Manager for the branch which it has established to serve the states of New Hampshire and Vermont.

Mr. Jones has been a bridge contractor for several years at Penacook, N. H., and has also engaged in dam and mill construction. During the past two years he has been one of New Hampshire's leading producers of mica, that strategic war material which is found in the New Hampshire mountains. The Nancy mines, 1 and 2, located at Groton were owned and operated by Jones, together with the rifling mills where the mica was procured. He is also a former engineer with the New Hampshire State Highway Department.

Two contractors in New Hampshire

COMPLETE WELL POINT SYSTEMS

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hauling construction equipment. In the spring the trucking concern will rent a garage in Concord where Mr. Jones will have his headquarters. He is prepared to furnish the familiar yellow-brown Hall equipment to any contractors in that part of New England who need trucks or cranes. C. L. Fox is General Manager at the Somerville, Mass., office.

Form 9106. This tractor has 55-hp drawbar, and operates on five forward speeds, 1.4 to 5.8 mph, and on four reverse, from 1.8 to 5.4 mph. The booklet describes the operation of the diesel engine and fuel system, the details of the frame and track construction, and the application of the "finger-tip steering" principle. A table of specifications and illustrations of the complete line of matched equipment for the D6 are included.

Robins Office in Alabama

Offices from which to serve the industrial South have been opened in the Brown-Marx Bldg., First Ave. and 20th St., Birmingham, Ala., by Robins Conveyors Inc., Passaic, N. J. They will be under the direction of Charles A. Thompson, who was sales engineer in the Pittsburgh office before the war. Mr. Thompson, whose territory will include all southern states east of the Mississippi, was a Lieutenant Commander in the Navy until recently.

are now hiring 19 Mack Model FN trucks with 5-yard bodies and chain drives from C. E. Hall & Sons, which owns several hundred trucks, and 18 trailers which are used primarily for

Caterpillar Presents

Illustrated Brochures

Two illustrated brochures have been released by the Caterpillar Tractor Co., Peoria 8, Ill., and are available on request to readers of CONTRACTORS AND ENGINEERS MONTHLY. Form 9002, titled "It Pays to Be a Caterpillar Owner", shows Caterpillar products in action under many circumstances, handling widely diversified operations in numerous fields. The advantages of Caterpillar equipment in relation to the type of work illustrated are stressed.

The Caterpillar D6 tractor is completely described in a 32-page booklet,

We build a wider and more complete line of material handling buckets than any other manufacturer.

Volume production methods enable us to build a better bucket with amazing economies in manufacturing.

... Experience Counts ...

AMERICA'S MOST COMPLETE LINE OF MATERIAL HANDLING BUCKETS

Clamshell sizes ½ to 2 yds.

Pullshovel sizes ½ and ¾ yd.

Shovel sizes ½ to 18 yds.

Dragline sizes ½, ¾, 1, 1½, 2, 2½ yds.

On the ½ yd. and ¾ yd. sizes of Shovel, Pullshovel, and Dragline Buckets, all teeth are interchangeable... a great convenience to operators.

Quality Since 1880

PETTIBONE MULLIKEN CORPORATION

4700 West Division Street, Chicago 51, Illinois

AED MEMBER

Penetration Pavement



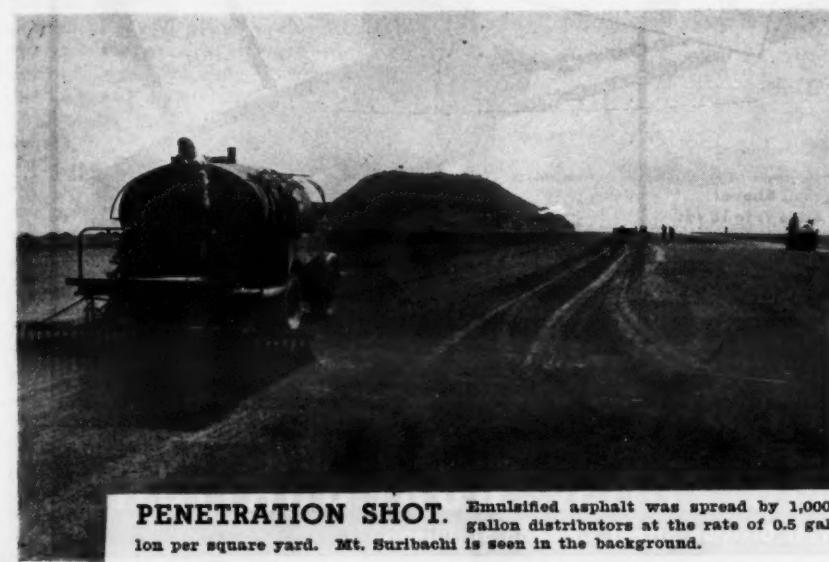
ON THE BEACHES of Iwo Jima, which had been vigorously fought over to secure the island, Seabees found boulders for use at their rock-crushing plant before a quarry face could be opened. Plenty of shrapnel with the rock presented a problem at the plant and necessitated a "picker" to remove it from the conveyor belt.



DRILLING. As soon as possible, a 30-foot quarry face in the andesitic lava rock at the north end of the island was opened up. Ingersoll-Rand wagon drills, powered by two 500-cfm compressors were used to make three 20-foot holes at 40-foot intervals, for blasting.



CRUSHING PLANT. The rock-crushing plant included a Pioneer primary jaw crusher, two Universal jaw crushers, a splitter bin which divided the material in half, and a twin set-up of Universal roll crushers, with conveyors to move the material.



PENETRATION SHOT. Emulsified asphalt was spread by 1,000-gallon distributors at the rate of 0.5 gallon per square yard. Mt. Suribachi is seen in the background.



ROLLING. A layer of torpedo gravel was placed on the asphalt, rolled by a Galion steel-wheel tandem, and then tack-coated with 0.3 gallon of the same 50-50 emulsion.

Engineering on Iwo Jima



TOUGH ROCK. Due to the hardness of the rock, the Jackbits used wore down quickly. Lieut. M. B. Kite, CEC, USNR, who was in charge of at 40-ton rock-crushing plant, holds a new bit in his right hand and a well worn one in the left. An I-B sharpener restored the worn bits to use.

Fighter-Plane Runways Are Surfaced With Penetration Macadam to Ease Load On Hot-Mix Plant; Steps in Quarrying, Crushing, and Paving Operations

U. S. Navy Photos

(See article on page 39)



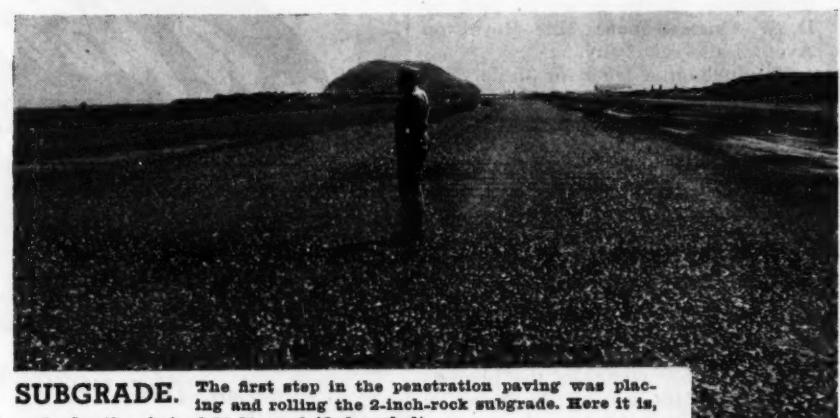
STOCKPILING. Allis-Chalmers tractors and bulldozers moved the processed material on the stockpiles. The machine in the foreground is handling 1 to 2-in. rock for airfield subgrade; the minus-1-inch material went to the hot-mix plant.



BLOTH COAT. No. 4 rock dust was spread on the tack coat as a blotter, and then rolled.



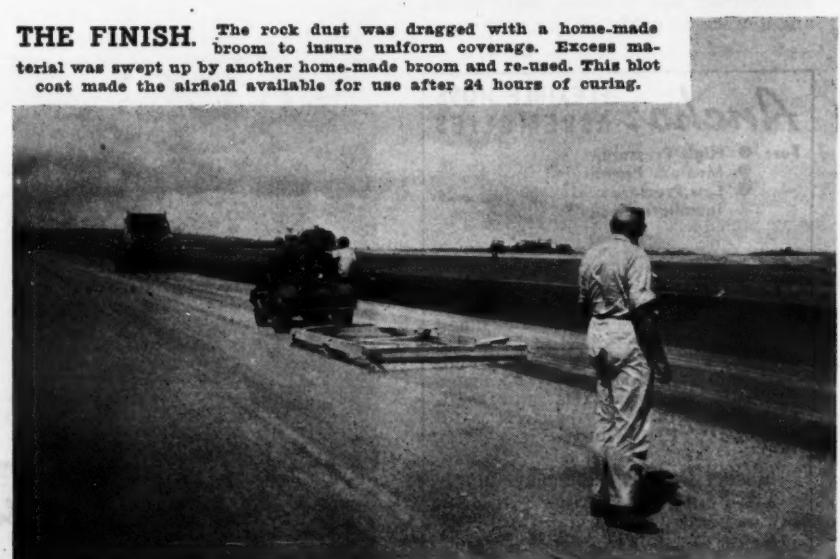
LOADING OUT. After a blast, the rock came tumbling down well sized for the crusher and was loaded to 2½-yard trucks by a Northwest shovel with an Amoco dipper.



SUBGRADE. The first step in the penetration paving was placing and rolling the 2-inch-rock subgrade. Here it is, ready for the shot of 50-50 emulsified asphalt.



ASPHALT STORAGE. The 52-gallon drums of asphalt were stored at a transfer plant, emptied into a vat, and then pumped to the bituminous distributor.



THE FINISH. The rock dust was dragged with a home-made broom to insure uniform coverage. Excess material was swept up by another home-made broom and re-used. This blot coat made the airfield available for use after 24 hours of curing.



This service station on wheels, including a Convoy Luber and an Onan electric plant (in circle), is equipped to furnish Marfak lubrication, tire service, battery charging, or repair on the job night or day.

Portable Lubricator Has Onan Power Unit

A service station on wheels, which lacks only the gas pumps, is an interesting adaptation of the Graco Convoy Luber devised by the Northeast Fuel Corp., Springfield, Mass., and utilized in building the Alaska Highway. The outfit is based upon a basic Convoy Luber built by the Gray Co., 60 11th Ave., N. E., Minneapolis 13, Minn., utilizing an electric generator built by D. W. Onan & Sons, 1248 Royalston Ave., of the same city.

Mounted on a truck or trailer, the unit brings high-pressure lubrication and related services to the site where fleets of trucks, construction machinery, and other equipment are being used. It is entirely self-contained, with built-in lubricant tanks, hose reels, compressor, tools, and accessories. An Onan OTC-2 electric generating plant, mounted on the air-compressor tank, furnishes current for lights and battery charging, and serves as prime mover for the compressor. Generating 115 volts and 1,500 watts ac, the plant is single-phase 60-cycle. It is driven by a 2-cylinder air-cooled gasoline engine that develops 3.1 hp at 1,800 rmp. Start-stop buttons are located on the control box. Using storage-battery current, the dc windings serve as a powerful starting motor. A separate dc circuit connected to the exciter winding provides the current for battery charging.

Welding Course for Vets

Contractors, highway department officials, and others who have shop employees returning from military service are advised that specialized training in metal work and welding is available to these men under the G.I. Bill of Rights at the Hobart Trade School, Inc., conducted by Hobart Brothers Co., Troy, Ohio.

Ohio. Sixteen weeks of training are given in the following subjects: arc and acetylene welding, special alloy-metal welding, carbon arc welding, hard-facing and tool welding. Metallizing with metal

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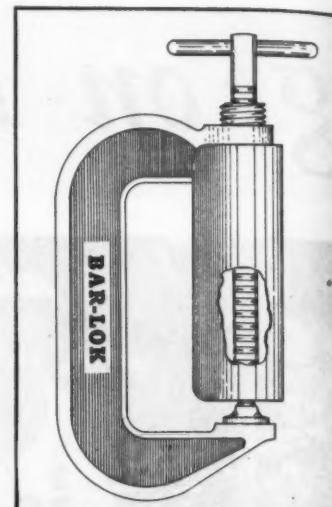
at any Veterans Administration Field Office or direct from Hobart.

Quarter Turn Locks New Shielded Clamp

A C-clamp, which features a quick-acting Bar-Lok and a detachable shield for protection when used in welding, has recently been announced. Opened to full capacity by turning the handle to the left until the bar is free, the clamp is closed by pushing firmly against the material to be gripped and turning the handle to the right until the desired pressure is obtained. A quarter turn is all that is needed to lock or unlock.

Precision-built for medium duty, the clamp is available in sizes having 2, 3, 4, and 6-inch openings which range in depth from $1\frac{1}{4}$ to 3 inches. The detachable shield for use in protecting the clamp from welding splatter is available with the 3, 4, and 6-inch sizes.

A circular on the Bar-Lok shielded clamp may be secured by writing to



This new C-clamp has a special
bar lock and shield.

Mechanics Engineering Co., Box 243
Jackson, Mich.

spray gun, resistance welding, "submerged melt" process, stud gun welding, and the Heliarc method. Further information may be secured

Further information may be secured

two brand new asphalt plants

for the bigger jobs -
MODEL "F"

THE MODEL "F" (batch type)

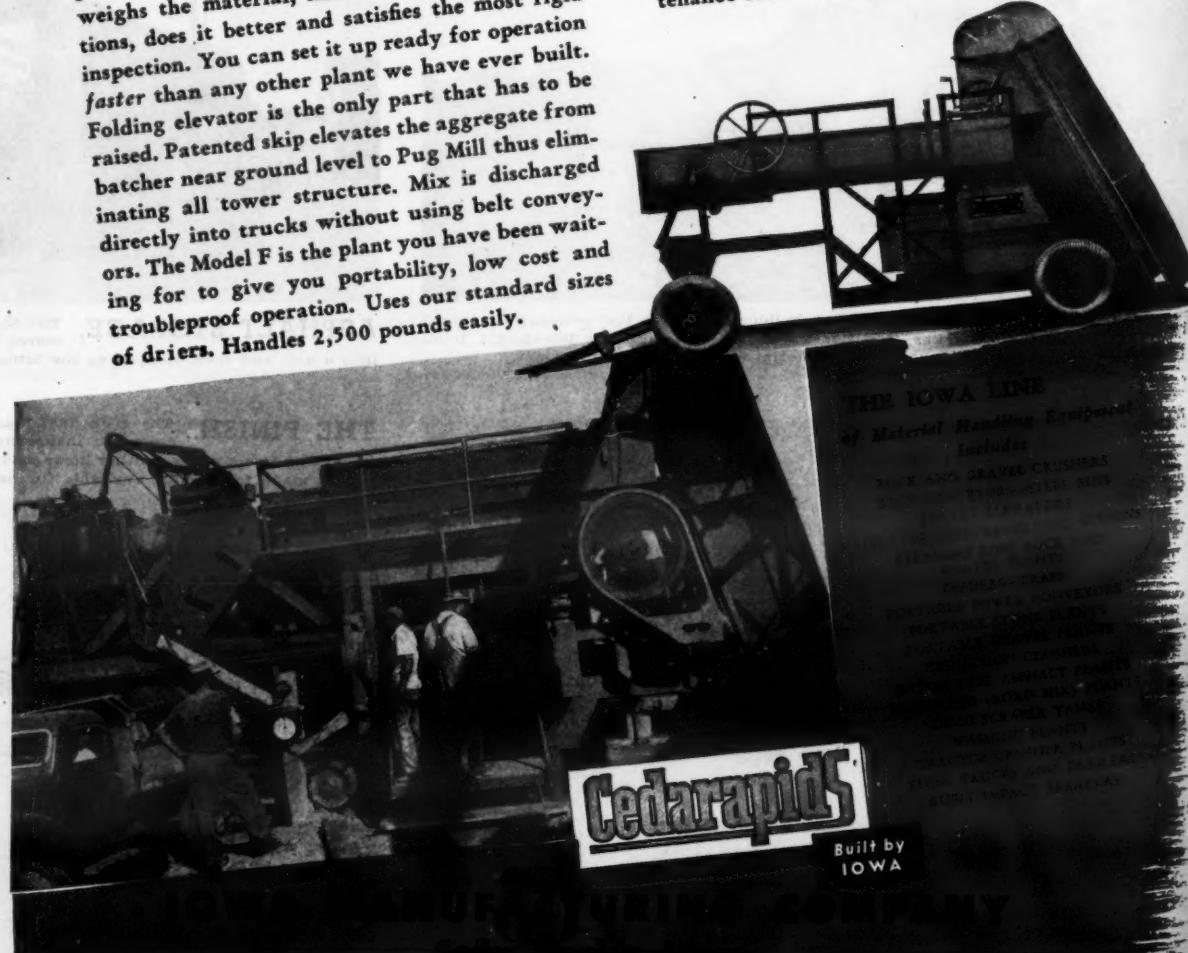
(batch type)

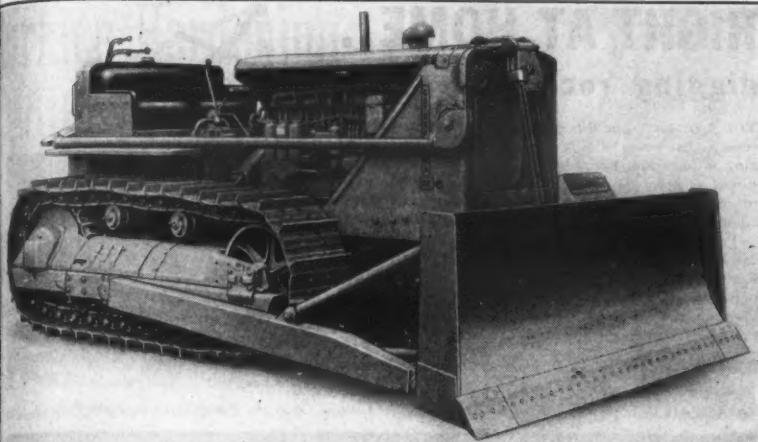
Here's the most portable, 2,000 lb. batch type plant you ever saw. It grades the aggregate, weighs the material, mixes it to suit specifications, does it better and satisfies the most rigid inspection. You can set it up ready for operation faster than any other plant we have ever built. Folding elevator is the only part that has to be raised. Patented skip elevates the aggregate from batcher near ground level to Pug Mill thus eliminating all tower structure. Mix is discharged directly into trucks without using belt conveyors. The Model F is the plant you have been waiting for to give you portability, low cost and troubleproof operation. Uses our standard sizes of driers. Handles 2,500 pounds easily.

for the smaller jobs -
THE PATCHMASTER
(continuous-mix type)

THE PATCHMASTER (continuous-mix type)

(continuous-mix type) Its name describes it perfectly — the ideal machine for making patch material for anybody's paved roads or streets — anywhere. The Patchmaster is a continuous-mix type plant that will turn out a remarkably accurate mix at the rate of 25 to 30 tons per hour. Available mix with or without running gear, or drier, this new plant can be used as a portable or stationary plant to meet practically any plant mix problem. Gasoline or diesel engine or electric motor for power. Low priced — Low maintenance cost — Better mixes.





The new Caterpillar line of bulldozers, to be ready for delivery this winter, includes straight and angling blades in several sizes. Here is an SS for use on a D8.

Caterpillar Dozers Now in Production

Announced last year as post-war additions to the Caterpillar line of equipment, cable-controlled bulldozers and scrapers are now in production. This step marks the firm's entry into the field of earth-moving equipment. Bulldozers for crawler diesel tractors D8 and D7 will be ready for delivery this winter, and scrapers, in several sizes, early in 1946.

Built to match in capacity the power of the tractor for which they are designed, the bulldozers are available with angling blades in Model No. 8A for use with a D8 tractor, and No. 7A for the D7, and with straight blades, as Nos. 8S and 7S, for D8 and D7 tractors, respectively. Their features include balanced design, rigid construction, elimination of overhead structures, reinforced blade, enclosed operating cables, long-life cutting edges, easy blade adjustment, quick mounting, correctly grooved sheaves, long cable life, high lift, low drop, unit manufacture, and one service source for both tractor and blade mechanism.

These new products, which have been subjected to thorough testing on the company's proving grounds and a number of projects throughout the United States, will be sold and serviced at Caterpillar's extensive network of dealers.

Specification sheets on the new straight or angling blades may be obtained by readers of CONTRACTORS AND ENGINEERS MONTHLY direct from the Caterpillar Tractor Co., Peoria 8, Ill.

Road Work to Employ Over 2,000,000 Men

"Highway reconstruction and relocation will play important parts in our early activities", James J. Skelly, President of the American Road Builders' Association, said recently, commenting on the fact that over \$1,000,000,000 has been made available for road building during the current fiscal year, now that Congress has concluded the war emergency in relation to highway construction.

Emphasizing that road building should be regarded as a long-range program, continuing for many years, Mr. Skelly estimated that for the immediate future nearly 1,000,000 men would be required in highway construction, with 1,250,000 more needed to produce and transport materials and equipment. Supplying work for some 2,000,000 men is a notable contribution towards solving the nation's unemployment problem", he stated.

"While thousands of miles of new highways are needed", the ARBA President said, "immediate attention must be paid to the obsolescent mileage that has been piling up for years until it has reached staggering figures." In 1940 it was estimated that \$3,500,000,000 would be required to rebuild, widen, or relocate 106,560 miles of then obsolescent highways, and an additional \$500,-

estimated that obsolescence has grown to twice that huge figure", he said.

Mr. Skelly called attention to the fact that the Federal-Aid Highway Act of 1944, for the first time in the history of government participation, had provided funds for farm-to-market roads and for municipal streets. "The administration and planning for this construction because of Federal Aid will necessitate close cooperation by state, county, and city highway officials, and close coordination of their activities. Our post-war highway program is so vast and has so many phases that the public has not yet realized its size and importance", he concluded.

New Pump Strainer

Developed as a wartime protective and conservation measure for critical pumping equipment, a new low-swing strainer has been added to the Ezy-Kleen line of strainers made by the Blackmer Pump Co., Grand Rapids, Mich. They will be glad to send further information on request.

Perforated metal, steel, or bronze is used instead of wire screen for the strainer basket to provide greater durability. The basket is quickly removed for cleaning as slotted lugs on the top plate line up with the lugs of the strainer body to receive four holding bolts. Designed for flange mounting, the strainer is compact for mounting in small space or in lines along walls.

Present production is limited to a capacity of 100 gpm with 2-inch, 2½-inch, and 3-inch intake and discharge sizes. The maximum operating temperature is 600 degrees F, and the maximum pressure is 75 psi.

000 for widening or rebuilding 21,682 bridges, Mr. Skelly pointed out. "Since there has been practically no new road building and very haphazard maintenance in the past five years, it is now

Goodrich Names Windram

James A. Windram, St. Louis Sales Representative for the Industrial Products Division of the B. F. Goodrich Co. has been named Manager of the St. Louis district, succeeding George Livermore, who has retired after 30 years of service.

Richkraft

SKUFRUF

...The Go Sign to
keep your jobs rolling

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Richkraft paper makes the job of subfill protection easier and economical. This builder is "keeping his job rolling" ... and meeting Fed. Spec. UUP 264 ... with Richkraft.

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When roofing material was delayed, this builder used Richkraft Skufpruf "Tens". This tough ten foot width paper ... a Richkraft "first" ... helped him stay right on job progress schedule.

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Wide Richkraft Skufpruf "Tens" protect and provide low-cost curing of finished cement floor for this builder. Using Skufpruf "Tens" means less lapping ... 30 per cent less than when standard 7 foot rolls are used.

GO

HERE'S a real building paper ... designed by construction men for construction uses ... Richkraft Skufpruf "Tens" are our 10 foot rolls—the perfect width for curing floors, protecting materials stored in the open, etc. This ten foot width of Skufpruf covers 30 per cent more floor area with fewer laps ... less labor.

Fewer laps mean fewer chances for floor damage. Added up, it means less labor—less trouble—more profit per job. (Of course, Skufpruf is available in regular standard sizes too.)

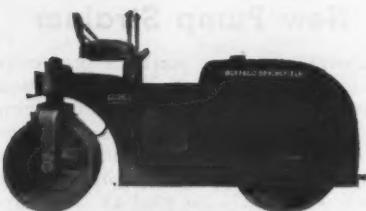
All Skufpruf paper has been given our special Plasticizing Treatment ... not the surface or "Puddle treatment" commonly offered ... Skufpruf Plasticizing is done to the raw kraft pulp itself. This means Richkraft Plasticizing becomes an integral part of the paper ... a part of the wood fibre itself.

Here's what Richkraft Skufpruf is: Two sheets of plasticized treated kraft, EACH coated with asphalt and combined with tough jute reenforcing ... all done in one of the world's most modern mills. The result is a waterproof, scuffproofed paper, second to none. Richkraft S-K-U-F-P-R-U-F ... easily identified by its green tint ... Skufpruf Green ... The go sign that keeps your jobs rolling in all kinds of weather. Write for the booklet "The Mills Behind Richkraft."

The RICHKRAFT Company

General Offices: Builders Building, Chicago 1, Illinois

Eastern Office: Westport, Conn. Western Office: Pacific Building, Oakland 12, Calif.



Buffalo-Springfield's new 3 to 4-ton roller can be made readily portable with a pneumatic-tired towing unit.

Portable 3 to 4-Ton Tandem Roller Ready

Specially designed for the compaction of driveways, parking areas, sidewalks, and similar jobs, a new 3 to 4-ton tandem roller has been added to its 1946 models by the Buffalo-Springfield Roller Co., Springfield, Ohio. The machine is highly mobile as a result of a responsive low-pressure hydraulic steering control. It decreases the amount of hand tamping necessary around corners, as the roller is capable of moving freely along walls and curbs.

The engine with its two-speed transmission is mounted in a single unit assembly, with all gears, except the bevel-gear final drive, enclosed in a precisely machined housing. The operator is permitted to work the roller close to obstructions by the drive-opposite-operator design which gives greater visibility. The drive roll and guide roll are both of large diameter. All-welded steel-plate and steel-channel frame, readily accessible controls, two Twin Disc clutches, precision-cut and heat-treated alloy-steel transmission gears, ball and roller bearings throughout, side air intake, and heavy-duty gasoline power are standard Buffalo-Springfield features which are included in this new roller. Optional equipment provides a pneumatic-tired towing unit with a low center of gravity, making for high-speed transportation behind a small truck.

Further information on this Buffalo-Springfield 3 to 4-ton roller may be secured by contractors and state and county highway engineers direct from the manufacturer. Just mention this item.

Chrysler Establishes Engine Dealer Set-Up

Details for the creation of a dealer organization to undertake direct sales have been announced by the Industrial Engine Division of the Chrysler Corp., Detroit, Mich., which carries on all sales, distribution, service, and engineering functions relative to industrial engines. The dealer organization will not interfere with already established contacts between the factory and those manufacturers who buy this equipment direct for use in various machines.

Dealerships will be assigned on the basis of the applicant's ability to furnish adequate facilities, equipment, and personnel. While in some instances dealers for other Chrysler products will be utilized, industrial engines will be treated as an entirely separate business, not as a "sideline". It is expected that new firms will be organized for the express purpose of handling industrial engines, while with many other companies it will be a natural addition to the established industrial line they are now carrying.

A large potential market, over and above the needs of manufacturers, exists for industrial engines, the Division said, in announcing the new set-up. On this basis it feels that dealers can create for themselves a large volume of new and replacement business, in addition to service and parts for engines now in use. Over ten years ago, Chrysler began making engines for various types of equipment at the request of manufacturers. During the war, the Industrial Engine Division was expanded to provide engines for such

products as air compressors, arc welders, booster pumps, cranes, tractors, fuel pumps, gang mowers, winches, generator sets, lift trucks, shovels, portable saw mills, rollers, pulverizers, and street flushers.

New York Local Units Are Paid for Snow Work

The final audit of payments for extraordinary snow-removal expenses incurred by the municipalities and counties of New York State during last year's extremely rigorous winter shows a total of \$4,717,412.80, the State has announced. Pursuant to Chapter 473 of the 1945 Laws, 956 of a total of 958 claims have been paid from a special appropriation of \$5,000,000 voted by the Legislature at Governor Dewey's request. The emergency was especially acute in western New York, where snowfalls of unprecedented depth put a very great burden on those responsible for keeping the highways open to winter traffic.

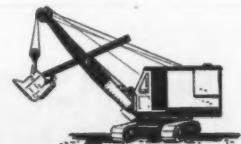
RIGHT AT HOME.. digging rock and stone

YOU COULDN'T put this bucket on a tougher job. For years it has been helping deepen a ship channel, digging in hard flint bottoms one day, handling rocks and stones on other days. Yet, because its lips and teeth are protected against rapid wear with Coast Metals Hard-Facing, it has been rendering outstanding performance.

YOUR bucket teeth, lips, runners and other parts also can be given a new lease on life by Coast Metals Hard-Facing! Or, better yet, hard-face your NEW bucket parts and they will serve ever so much better. Then, after slight wear, they can be rebuilt repeatedly and the cost and delay of getting replacement parts eliminated.

Write for "How To Make Construction Equipment Last Longer"

COAST METALS, INC. Plant and General Offices: Canton, Ohio • Executive Offices: New York 19, N.Y.



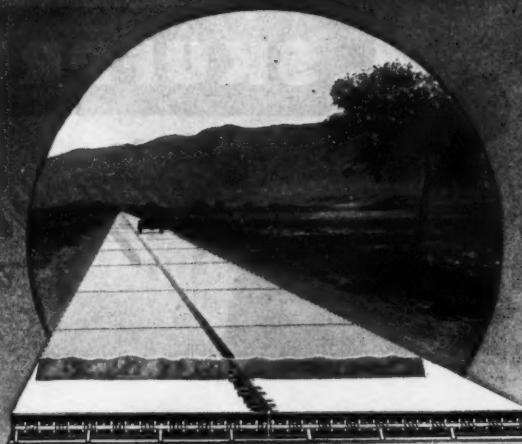
COAST METALS

hard-facing
weld rods

MAKE YOUR EQUIPMENT LAST LONGER

There's no Disagreement on

Road Joints!

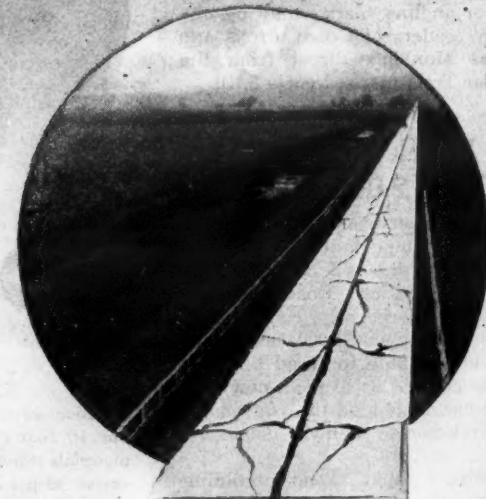


A GOOD INSTALLATION WITH KEYLODE TRANSVERSE JOINTS

In the 20s and 30s when concrete road building was getting its start, it was logical for highway engineers to resist the use of metal road joints. These joints were costly and new. Their use would cut down the total miles of hard road that could be built with the money at hand—and farmers were stuck in the mud.

The objective then was miles today. The cost tomorrow to maintenance was a secondary consideration.

In 1934 Federal engineers, realizing the necessity for crack control in concrete pavements, issued a bulletin requiring expansion and contraction joints on all new federal-aid highways. The large reduction in maintenance costs on federal-aid roads attests the wisdom of this action.



A POOR INSTALLATION WITH NO TRANSVERSE JOINTS

Today there's no disagreement on road joints. Everyone agrees that crack control in concrete pavements by the use of load transferring expansion and contraction joints is an economic necessity. The only unsettled problems involve the spacing, the design and the cost.

The mass of available data will make it easy for highway engineers to establish a joint spacing standard soon.

Many engineers have already decided that the KEYLODE contraction joint is the design they want—and the cost of KEYLODE joints is so little that you can get BOTH miles today and crack control tomorrow for the same money.

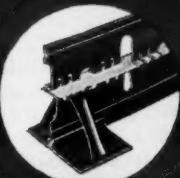
Write for Bulletin

HIGHWAY STEEL PRODUCTS CO.

Chicago Heights, Ill.

KEYLODE

CONTRACTION JOINTS



Surface Hardening With a Gas Flame

Soft Steel Given a Hard Surface While Retaining Tough Core; Valve Stems, Plows, Blades Treated

FLAME-HARDENING is a method of surface-hardening certain kinds of iron and steel by rapidly heating the surface of the metal with an oxy-acetylene flame and then quickly cooling or quenching the heated area. As a result of the changes that take place in the metal, the part has the highly desirable combination of a hard wear-resistant surface with a tough shock-resisting core.

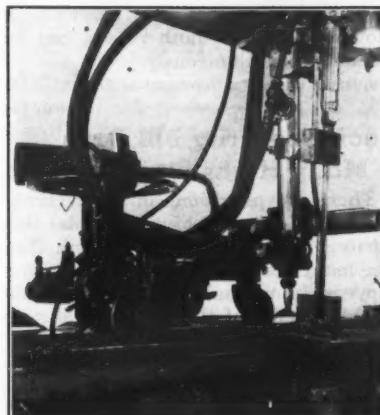
As the definition implies, the essential elements of a flame-hardening set-up are a blowpipe for controlling the oxy-acetylene flame and a means of quenching the heated part. This article illustrates and describes a number of simple set-ups that small shops have found useful for small-lot production flame-hardening, and which may prove of value in equipment maintenance shops.

There are four general methods of flame-hardening in common practice. The first and simplest procedure is that which is commonly called "spot-hardening". This involves the heating of only a small localized area, such as the tip of a valve stem, to a red heat and then rapidly cooling that area.

A second method of treatment, most suitable for flame-hardening flat surfaces, such as large gear teeth or machine-tool ways, is known as the progressive method. By this method, an oxy-acetylene flame or group of flames of the required width is passed over the surface to be hardened at such a speed as to bring that surface to a bright-red heat under the flame. The heated area is quenched by a stream or spray of water which moves with and immediately behind the flame at a point where it will provide proper quenching effect and yet not interfere with the flame.

A third method of applying the flame-hardening process is known as the spinning method. In this type of treatment, a round or cylindrical piece to be treated, such as a small gear or pulley, is revolved in front of an oxy-acetylene flame until the path immediately under the flame is brought to the required red temperature. The heated area is then quenched by directing a stream of water on the spinning object after withdrawal of the flame, or by releasing the heated piece and allowing it to drop into a bath of water or oil.

The fourth method of applying the flame-hardening process is known as the progressive-spinning or combination method. As the name indicates, this method is actually a combination of the progressive and spinning methods. It is particularly satisfactory for treating long cylindrical objects, such as shafts and pump rods, when a hardened surface is desired over a considerable length. As the object is spun between centers past the oxy-acetylene



In this set-up for flame-hardening long blades, the cutting machine carries the blowpipe and specially made heating and quenching head.

flame, the flame is also moved lengthwise along the rod or shaft, heating the surface to a bright red in passing. The quench follows the flame exactly as in the progressive method and is applied

while the object is spinning.

Spot-Hardening Method

As pointed out, the elements of a flame-hardening set-up are a blowpipe and a quench. One of the simplest such set-ups is that for flame-hardening the ends of valve stems. For this application a standard blowpipe equipped with a special multiflame head is used. The valves are placed head down in water and the operator heats one valve end at a time. When the flame is removed, the water closes around the tip, providing an "automatic" quench. As many as 1,000 valves have been treated per hour with this spot-hardening set-up.

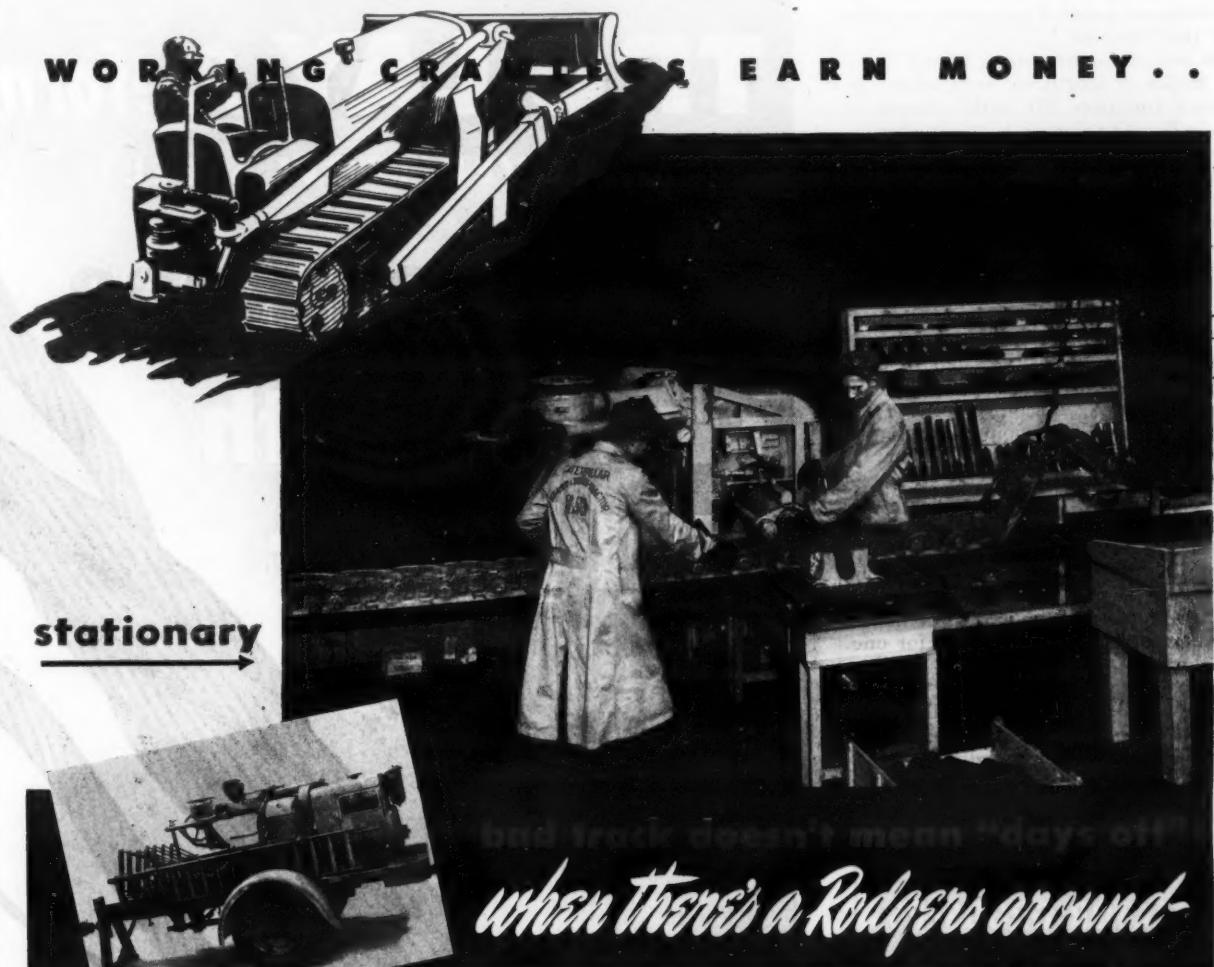
Another example of spot-hardening is the hardening of lifter pads on valve rocker arms. The arms are mounted on pins protruding from the fixture and adjustable stops are provided to maintain the correct space between the pad and tip. The cutting oxygen is not connected on the machine-cutting blowpipes. After the pads have been heated for the proper length of time, the rocker



The tube supplying quenching water is attached to the blowpipe in this set-up for flame-hardening plowshares.

arms are slid off into a quench tank in front of the set-up. As many as 350 arms per hour have been treated with this installation.

For the flame-hardening of plowshares, a welding blowpipe is fitted with
(Concluded on next page)



when there's a Rodgers around-

RODGERS CRAWLER TRACK PRESSES

You don't need to "retire" your crawler equipment for a couple of days for track maintenance . . . you don't need a gang, or a sledge, or a torch either — no Sir! — not when there is a Rodgers Track Press on or near the job. That's because a Rodgers will service 2 large strings of track in the average machine time of 3 to 4 hours.

A Rodgers has an exclusive feature in the Retractable Jaw which eliminates lifting the track over a stationary jaw and assures proper bearing support against the inner side of the rail, thus properly spacing the rails, eliminating any binding action — leaves tracks flexible after servicing. And the Rodgers Track Wrench is the handy answer to tight, frozen nuts.

You can get a Rodgers Crawler-Track Press in portable models: 2 wheel trailer or 4 wheels; and in stationary shop models. Write now for complete details; or see your crawler equipment dealer — he will tell you what a Rodgers can do to save you time and labor.

TRANSITS and LEVELS HEADQUARTERS for REPAIRS—any make

We will buy or trade in old Transits, Levels, Alidades, etc. Send instruments for valuation.

Write for new Catalog CE-112 of Engineering Instruments, Engineering Field Equipment and Drafting Room supplies.

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Mfrs. of Sterling Transits & Levels
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Mr. Contractor

Your dealer probably has Rodgers Track Servicing Presses in his service department for the purpose of helping you maintain your equipment. If he hasn't and your requirements won't justify your having a Rodgers Press of your own, urge him to investigate the savings of a Rodgers. It will pay you both!



Shop Presses

Rodgers Hydraulic, Inc.

hydraulic power equipment



Portable Presses

Crawler-Track Presses 7415 Walker St., St. Louis Park, Minneapolis 16, Minn. Power Pump Units

Surface Hardening With a Gas Flame

(Continued from preceding page)

a copper tube for the quenching water (attached with a C-clamp and a cable clamp) and the operator guides the combination slowly along the edge of the plowshare. The plowshare should be tipped, and the flame-hardening operation starts at the nose and proceeds uphill, so that the quenching water will not run over the untreated surface.

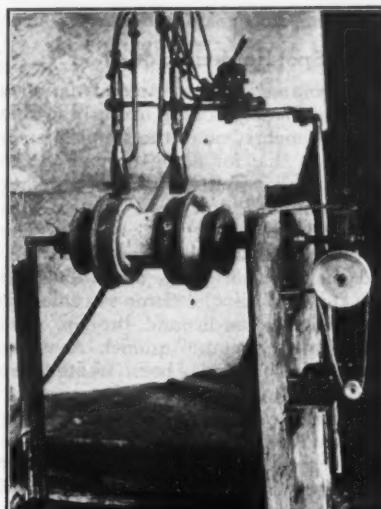
Progressive Hardening

A general rule in all flame-hardening operations is that the neutral oxy-acetylene flame should be held as nearly as possible at right angles to the surface being hardened, with the tip of the inner core not closer than 1/16 to 1/8 inch from the metal. To help the operator maintain a constant distance between the inner core and the surface of the metal, it is usually desirable to provide some sort of a supporting guide for the blowpipe.

A set-up for hardening blades 20 to 30 inches in length, or even longer, is shown (on page 53) with a specially made flame hardening head attached to a standard welding blowpipe. Notice that the water-quenching head is attached to the back of the 2-inch-wide flame-hardening head. The cutting machine is used without alterations for cutting the blade blanks out of steel plate in addition to powering the flame-hardening head.

A portable cutting machine may be used as motive power for flame-hardening the rails on which a sawmill carriage operates. For this set-up the standard welding blowpipe is equipped with a rhomboid head having twenty flame ports. Since the work is done out of doors it is not necessary to provide means of collecting the quenching water.

In the flame-hardening of circular parts, the blowpipe is often mounted in a fixed holder and the part to be hardened is rotated past the flame for one revolution. A set-up of this type is shown for hardening pairs of single-flange tractor rollers. The rollers are mounted between conical centers on a home-made jig and rotated by a small



A shop-built rig for flame-hardening tractor rollers in pairs.

electric motor through a reduction gear. Specially made thirteen-flame heads

are attached to two standard welding blowpipes so that both rollers can be hardened simultaneously.

Illustrations courtesy of Oxy-Acetylene Tips.

Social Security Bill Bars Many Highway Employees

There are provisions in the recently introduced Wagner-Murray Social Security bill which, if enacted, will disbar many state and local highway employees from qualifying for the proposed benefits of the measure, despite the fact that the new bill includes employees of states and other political subdivisions among its beneficiaries.

Introduced in the Senate as S. 1050 and in the House as H. 3293, the measure specifically provides in Section 276 that any state or local political unit which "has established and maintains any pension, annuity, and benefit or retirement fund or any similar fund" shall be "expressly prohibited" from entering into any compact with the Social Security Board on behalf of its em-

ployees.

Officials desiring to comment on the automatic exclusion of public employees from participation in Federal Social Security benefits should write Senator Walter F. George of Georgia, Chairman of the Senate Finance Committee; Congressman Robert L. Doughton, North Carolina, Chairman of the House Ways and Means Committee; and Robert Huse, Director, Office of Information Services of the Social Security Board, 1825 H St., N. W., Washington, D. C.

Syntron Names Armstrong As Michigan Dist. Mgr

The appointment of J. A. Armstrong as District Manager for sales and service in Michigan, outside the Detroit Metropolitan area, has been announced by the Syntron Co., Homer City, Pa. From headquarters in Lansing, Mich., Armstrong will supervise the sale of vibratory equipment, electric tools, and Syntron self-contained portable gasoline hammers.

TRU-LAY Preformed

(IMPROVED PLOW STEEL)

All-Green Rope

**stuffed with
still longer
life!**



- Every single strand of TRU-LAY Preformed is literally stuffed with American

Cable's green lubricant—a high viscosity, leathery substance which adheres to the inner wires and won't work out. This means that the

many inner wires, which you can't see, are provided with a slip-easy film of oil plus being thoroughly protected against corrosion.

And when the wires move past each other without undue friction, and are protected against corrosion, the entire rope structure is benefited.

That's why TRU-LAY Preformed All-Green rope lasts still longer—gives even better service. Specify American Cable TRU-LAY Preformed All-Green rope for your next line.



See your local Equipment Dealer

Send for Folder CE

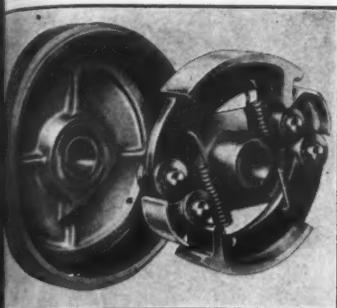
ALLIED STEEL PRODUCTS, Inc.
7835 Broadway
CLEVELAND 5, OHIO.

U.S.A.



In Business for Your Safety

AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE



The new Salsbury automatic clutch is designed to eliminate shock in starting construction equipment.

New Automatic Clutch Applies Load Slowly

An automatic clutch designed to eliminate the sudden shock of starting has been developed for use in the sale of small scrapers, bulldozers, graders, tools, and concrete mixers, winches, and other construction machinery. The device engages and disengages without human control, applying power progressively by centrifugal action.

This Salsbury automatic clutch is designed to permit complete disengagement while the engine is idling, and positive engagement when driving, without possibility of slippage. The elimination of overload stresses in overrunning inertia is said to result from improved starting and operating characteristics.

Applied in simple form, the centrifugal principle produces the desired degree of tension through the dual-spring banking of its opposed shoes. The clutch idles below a given rpm but, when this rpm has been passed, it takes hold, the expansion shoes pressing outward to contact the drum's friction ring.

The new automatic clutch is made in two sizes, 3 and 6 hp. The smaller has a drum diameter of 5 1/4 inches and a width of 2 11/16 inches. In the 6-hp size, the drum is 7 1/4 inches x 4 1/2 inches. Mounting the drives which can be mounted on the shaft are V-belt or flat belt, gear, sprocket, coupling, or variable-speed transmission.

Further information on the Salsbury automatic clutch may be obtained from Salsbury Motors, Inc., 4464 District Blvd., Los Angeles 11, Calif., on mention of this news item.

Light-Weight Steel Pipe For Use in Construction

Light-weight steel pipe has many applications in the construction field outside its installation by contractors in sewage-treatment plants. In its new catalog No. 44, Naylor Pipe Co., 1270 E. 95th St., Chicago 19, Ill., gives a clear picture of the development and services of Lockseam Spiralweld steel pipe. Construction men find this pipe valuable in dredging operations for both shore and floating lines; in its smaller sizes for high and low-pressure air and water lines; for hydraulic sluicing; for all-point systems; and for push-pull stabilizing lines in tunnel construction. Copies of this 54-page illustrated catalog may be secured by readers of CONTRACTORS AND ENGINEERS MONTHLY writing direct to the manufacturer and mentioning this review.

New Harnischfeger Office

The Harnischfeger Corp., Milwaukee, Wis., manufacturer of excavators, truck lines, welding equipment, and overhead materials-handling equipment, announced the opening of an office at 901 Dun Bldg., 110-112 Pearl St., Buffalo 2, N.Y. Managed by W. G. Bowman, the office will handle the complete Harnischfeger line in western New York, as far west as Wayne and Schuyler Counties, and in Erie, Crawford, Warren, McKean, and Potter Counties in Pennsylvania.

Fiber Road Joint Does Not Extrude

Flexcell, an expansion joint which does not extrude under compression, as do ordinary asphaltic joints, is made from long spring-like fibers of cane, saturated with a special asphaltic compound. The material is treated by the Ferox process to protect it from dry rot and termites, and by the Flexcell process which impregnates and coats each fiber with a durable compound without impairing its air-cell structure.

This fiber expansion joint meets the requirements of these specifications: AASHO M-59-42, Federal HH-F-334, tentative revisions of ASTM D-544-41, U. S. Engineer Office No. 3276, Bureau of Yards & Docks 4Yd, and others. It adheres to the concrete, and expands when compression is released, thus providing a tight joint that is firmly anchored in position. Light in weight, it is easily cut by hand or power saw. The original shape is retained while Flexcell is being installed due to the

stiff fiber construction. The product does not deteriorate or change shape in storage, it is claimed.

Flexcell is supplied by the linear foot in thicknesses of 1/4, 3/8, 1/2, 3/4, and 1-

inch, with widths ranging from 2 inches to a foot, in half-inch gradations. Further details may be secured by writing to the Celotex Corp., Dept. CEM, 120 So. La Salle St., Chicago 3, Ill.



A TOUGH ROLLER FOR TOUGH JOBS

Pierce-Bear 3 1/2-5 Tons Variable Weights

Engineered for economical operation where the going is tough. Compact, easy to operate. Rear roller gives heavy duty compression. Built-in water tanks for wet rolling. Powered with Allis-Chalmers Industrial Heavy-duty Model "B" gasoline engine. Write for details.

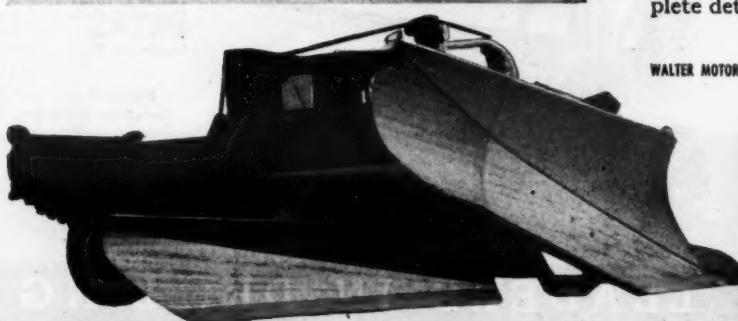
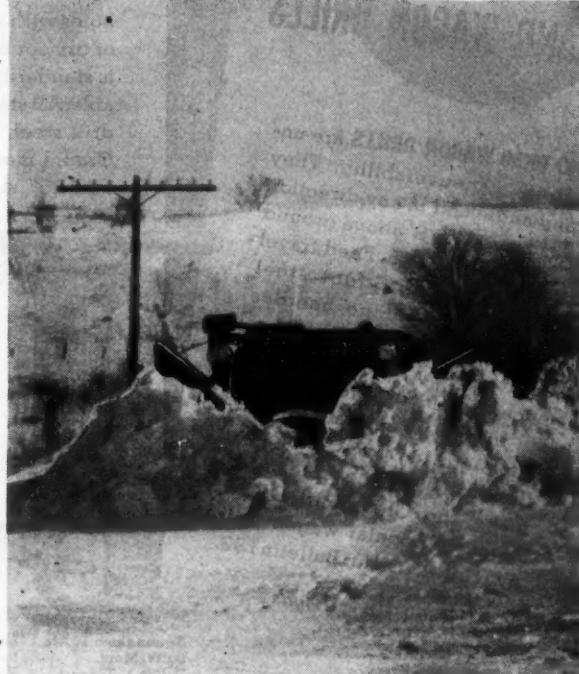
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H. W. LEWIS EQUIPMENT COMPANY
415-431 Hoefgen Ave., SAN ANTONIO 6, TEXAS Phone Garfield 6137 or 8931



WALTER SNOW FIGHTERS

clear more miles per hour!



TAXPAYERS have a dollar-and-cents way of rating snow removal results. Snow-bound roads that tie up traffic cost time and money—far more than it costs to get adequate protection with Walter Snow Fighters!

Walter Snow Fighters do a faster, more thorough job—because they have the specialized power, traction and ruggedness to remove more snow per hour than any other equipment. Road-blocking drifts are speedily cleared. Snow is removed before it packs and freezes into dangerous ruts. Main highways are completely widened-out sooner, permitting more time to clear secondary roads.

The extraordinary tractive power provided by the exclusive Walter Four-Point Positive Drive is responsible for this performance. Full power is fed to FOUR driving wheels according to their traction at any instant. No power is wasted in slipping, stalling or wheel-spinning. Every bit of power is concentrated on a powerful, straight-ahead PUSH that throws snow far to the side. Write today for complete details.

WALTER MOTOR TRUCK COMPANY, 1001-19 Irving Ave., Ridgewood 27, Queens, L.I., N.Y.





A special Isaacson blade on a hillside-model Cletrac speeds land clearing in the Pacific Northwest.

Special Combination Clears Land Speedily

Quick land clearing has been obtained by using a bulldozer with a specially designed blade and a crawler tractor with extra high clearance, according to the E. J. Johnson Construction Co., Everett, Wash. The combination also removes trash, stumps, and logs without disturbing the dirt, an improvement over usual methods and equipment, the firm says.

The crawler tractor used is an Oliver-Cletrac DGH gasoline-powered hillside model with extra-wide frame, wide grousers, and 61 drawbar hp. The distance from center to center of the tracks is 61 inches. The bulldozer is an Isaacson clearing blade, made by the Isaacson Iron Works, 2917 E. Marginal Way, Seattle 14, Wash., and has a sharp lower edge, a skim-the-ground working height, and an overhanging top edge.

The Cletrac, made by the Cletrac Division of the Oliver Corp., 1930 Euclid Ave., Cleveland 17, Ohio, is especially adaptable to land clearing because of its high clearance between the crawler tracks. The under side is protected by a smooth, flat, heavy steel plate. Hillside-model Cletracs are extra wide and have a low center of gravity to prevent tipping. Maneuverability is aided by the wide spacing of the tracks and the controlled differential steering in which both tracks are engaged all the time.

Hazards of Lightning In Construction Work

Three papers dealing with the hazards of lightning on construction projects were presented at a meeting of the Tennessee Valley Section of the American Society of Civil Engineers, and have been reprinted in a pamphlet for general distribution. This reprint may be secured from R. H. Nagel, Secretary-Treasurer, Tennessee Valley Section, American Society of Civil Engineers, Route 6, Knoxville 17, Tenn.

The first paper describes in detail the death by lightning of one of twenty-two men working on a drill jumbo at a heading in the Appalachia Tunnel of the Tennessee Valley Authority. No other workman was injured or even severely shocked. The second paper is devoted to the recurrence of premature explosions of loaded holes in river channels during thunder storms and the methods used to prevent damage. The third discusses lightning characteristics and explains the reasons for the casualties in the Appalachia Tunnel and on the drill barge.

ASTM Plans Two Meetings

The 49th Annual Meeting of the American Society for Testing Materials will be held June 24-28, 1946, at Buffalo, N. Y., the Executive Committee of the Society has announced. The 7th Exhibit of Testing Apparatus and Related Equipment will be held at the same

mittee Week, devoted to meetings of many ASTM technical committees. Extensive symposiums and many technical papers and committee reports are planned for both the Spring and Annual Meetings.

A New Screw Driver For Maintenance Men

Engineers, mechanics, and maintenance men will be interested in a new triple-purpose screw driver which incorporates a device for extra power. Known as the Tuffy, the screw driver is made by the Swallow Airplane Co., Inc., Wichita, Kans.

Tuffy has a power arm which folds into the handle for normal screw-driver usage. When in use, this arm affords a solid horizontal hand support which permits full hand and body pressure, to prevent slipping or gashing of the screw head.

The tool has an aluminum handle. The blade is drop-forged steel, plated to



Tuffy is a new screw driver featuring a power arm for greater pressure.

ward off rust. It is supplied with blade lengths of 5 x 1/4-inch, 6 x 5/16-in. and 8 x 3/8-inch. Details may be secured by writing the manufacturer and mentioning this item.

time. The Society will hold its 1946 Spring Meeting at Pittsburgh during the week of February 25. This will also be Com-

CLEVELAND DR30 WAGON DRILLS

CLEVELAND DR30 WAGON DRILLS are unsurpassed in maneuverability. They drill at any angle and in any direction—flat holes from 4" to 8' above ground—also straight up or down. Feed travel is over 8', permitting 6-foot steel changes, and the machine handles depths to 25' or more. The DR30 has a double screw U-bar jack, a recoil device to hold drill to its work, an improved centralizer, and a forward leg point to steady the drill. All these features make the Cleveland DR30 the most popular wagon drill ever built. Ask for Bulletin 132.

Buy Victory Bonds

CLEVELAND H10 SINKERS

CLEVELAND H10 SINKERS are favorites in the 45 lb. class. Easily held, these fast cutters have strong rotation, and blow the holes with unfailing certainty. Either wet or dry construction. "T" handle illustrated is standard; open spade handle also available. All standard chuck sizes for collared drill steel, and plain or lugged shanks. Cradle mounting available for 24", 30" and 36" steel changes. The end-seating valve improves with use—no increase in air consumption as the drill grows older. Efficient lubrication of even hard-to-reach spots like flutes of the rifle bar, forward chuck bearing, etc. Bulletin 122 describes Cleveland Sinkers in detail. Ask for it.

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LEADERS IN DRILLING EQUIPMENT

New Metal Slide Rule

Manufacture of the Deci.Point slide rule in light-weight Dowmetal has been announced by Pickett & Eckel, 53 W. Jackson Blvd., Chicago 4, Ill., maker of this new type of slide rule which places the decimal point at the end of long and intricate computations. Among advantages of Dowmetal is accuracy, since it is not affected by heat, cold or moisture and does not perceptibly warp, swell, or in any way distort, manufacturer states. As the metal can be machined to close tolerances, a centering "optical groove" can be cut. A flat white plastic impervious to

water or chemicals and virtually immune to abrasion is used to surface the Dowmetal core.

Full details may be secured from Pickett & Eckel on mention of this news item.

Three New Davey Dealers

The appointment of three new distributors, in New York, New Jersey, and North Dakota, has been announced by the Davey Compressor Co., Kent, Ohio, maker of portable and stationary compressors, pneumatic saws, and similar equipment.

Allied Equipment Corp., with offices

in Albany and Syracuse, will handle sales and service in central New York State. Leo V. Stockman is President, and C. L. West is Treasurer of the firm, which recently acquired the E. B. Kellogg Co. of Albany. A full line of compressors will be available for rental.

Sales and service will be provided in upper New Jersey by the North Jersey Equipment Co., 343 Elizabeth Ave., Newark. The company was formed recently by B. Chernin and L. Selzer, who were Vice President and Secretary-Treasurer, respectively, of the Henry Lohse Co., Newark.

In North Dakota, the Myhra Equipment Co. of Fargo and Grand Forks

will carry the Davey line. H. M. Myhra and his sons Melvin and Irving comprise the partnership, which is also a dealer for J. I. Case Co. and for Ford-Ferguson tractors.

Wickwire Promotes Rollo

Herbert D. Rollo, who has been stationed in Chicago and New York as Wire Rope Sales Engineer since 1933, has been named by the Wickwire Spencer Steel Division, Colorado Fuel & Iron Corp., to supervise its expansion in New England. The new District Sales Manager will maintain offices at 80 Federal St., Boston 10, Mass.

Proved...

*As No Other Rotary
Snow Plow Has Been Proved!*

- There are more Snogos in service than any other make of rotary plow. Behind Snogo is 18 years of service in the hands of highway departments, municipalities and airports. Repeat orders from state and county highway departments and cities of all sizes offer an array of testimonials to length of service and quality performance that can't be equalled.

A rotary plow is an operating piece of mechanism not to be compared with a blade hung on the front of a truck and depending on the brute force of the truck for action. It's as dead as a dodo if it doesn't operate.

After a blizzard when miles of highway are snowed under and drifted over is no time to experiment with somebody's untried machinery. Then is when you want a proved machine you can depend on—a Snogo. There is a Snogo for every budget from a 1½ ton truck to the largest four wheel drive type of truck. Ask for details.

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SNOGO
 A SNOGO For
EVERY BUDGET

Avoid Legal Pitfalls

Edited by A. L. H. STREET, Attorney-at-Law

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Is Subcontractor Bound By Prime-Contract Terms?

To minimize risks of future misunderstanding between prime contractors and subcontractors, references in the subcontract to the principal contract and specifications should clearly indicate the extent to which those provisions are to bind the subcontractor.

"When a subcontractor undertakes to do a portion of the contract work according to plans and specifications binding on the principal contractor, such plans and specifications become a part of his contract, at least to the extent that the subcontractor assumes the obligation of the general contractor in relation to the particular part of the work he performs." So declared the United States Court of Appeals for the District of Columbia in the recently decided case of Ehret Magnesia Manufacturing Co., defendant-appellant, v. Gothwaite, plaintiff-appellee, 149 Fed. 2d, 829.

In that case the court upheld judgement in favor of the plaintiff, prime contractor on a Government steam distribution job, for the cost of remedying defective work done by the defendant as subcontractor. The case turned upon the fact that the subcontractor had agreed to do certain work according to "plans and specifications, including addenda as prepared by the U. S. Engineers Office". That, the court decided, made the prime plans and specifications a part of the subcontract, so far as they indicated the work to be done by the subcontractor and the manner in which it was to be done.

The scope of the governing general rule of law was stated in a bit more detail in a case decided by the United States Circuit Court of Appeals, Third Circuit. (H. P. Cummings Construction Co. v. Marbleloid Co., 51 Fed. 2d, 906.) That case involved liability of a subcontractor to the prime contractor, who was called upon by an owner to make good flooring installed by the subcontractor, which cracked after being laid. That case closely resembled the first cited case, in that the subcontract required the work to be done according to the plans and specifications covered by the prime contract. Said the Court of Appeals, in deciding the case in favor of the subcontractor, on the ground that the evidence showed that cracking of the floors was not due to its fault, but to cracking of the building's foundation:

"But the reference in the subcontract to 'the plans and specifications of H. S. Coombs, Architect,' was evidently for the mere purpose of identifying the floors to be laid and the manner in which the work was to be done in laying them. The rule of law based upon authority and sound reason is that in the case of subcontracts, as in other express agreements in writing, a reference by the contracting parties to an extraneous writing for a particular purpose makes it a part of the contract only for the purpose specified."

The last quoted conclusion is in line with a decision rendered by the highest court of the land in the case of Guerini Stone Co. v. P. J. Carlin Construction Co., 240 U. S. 264. The substance of that decision was as follows: A subcontractor on a Government building job was not bound by provisions of the prime contract, requiring claims for damages for delays to be submitted for action by the Government supervising architect, although the subcontract referred to the principal drawings and specifications. That reference embodied the drawings and specifications only for the purpose of indicating what work was to be done by the subcontractor and in what manner.

In the last cited case, the United States Supreme Court decided that delays attributable to the Government were covered by a clause in the general contract, binding the general contractor to reimburse the subcontractor for loss resulting from the former's failure to "provide all labor and materials not included in this contract in such manner as not to delay the material progress of the" subcontract work.

Contract Was Controlled By Letter Accepting Order

An order addressed by a contractor to a material man provided, for partial payment monthly, the balance to be paid 60 days after completion of the work. The material man replied by letter that the order was accepted, subject to payment for materials within 30 days after each shipment. The letter enclosed duplicate copies of the contract, signed by the material man, who requested that the contractor sign and return one copy. The contract enclosed provided for payment as specified in the order, and the contractor stood on those terms. The material man stood on the terms stated in the letter. Litigation

differed as to terms of payment, but the letter outweighed it in that regard.

Contractor's Duty Defined In Prevention of Collapse

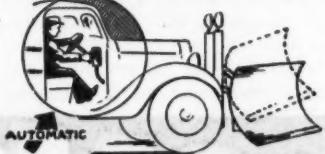
A sewer contract was executed in full compliance with the specifications, including requirements as to grade and depth. It was up to another and independent contractor to place a 15-foot fill over the sewer, which was only 6 or 8 inches below the surface, as left by the sewer contractor. Rejecting a con-

tention that the sewer contractor was liable for collapse of the sewer, the court said, part (Housing Authority, Pittsburgh, Sanctis Construction Co., 43 Atl. 2d, 581):

"The surface was in the exclusive control of the Authority. Sanctis—the contracting company—"of course, only guaranteed own skill, but did not guarantee the specifications. Whether the collapse . . . caused by improper specifications . . . whether the grading contractor's equipment collapsed it does not appear, but . . . (Concluded on next page)

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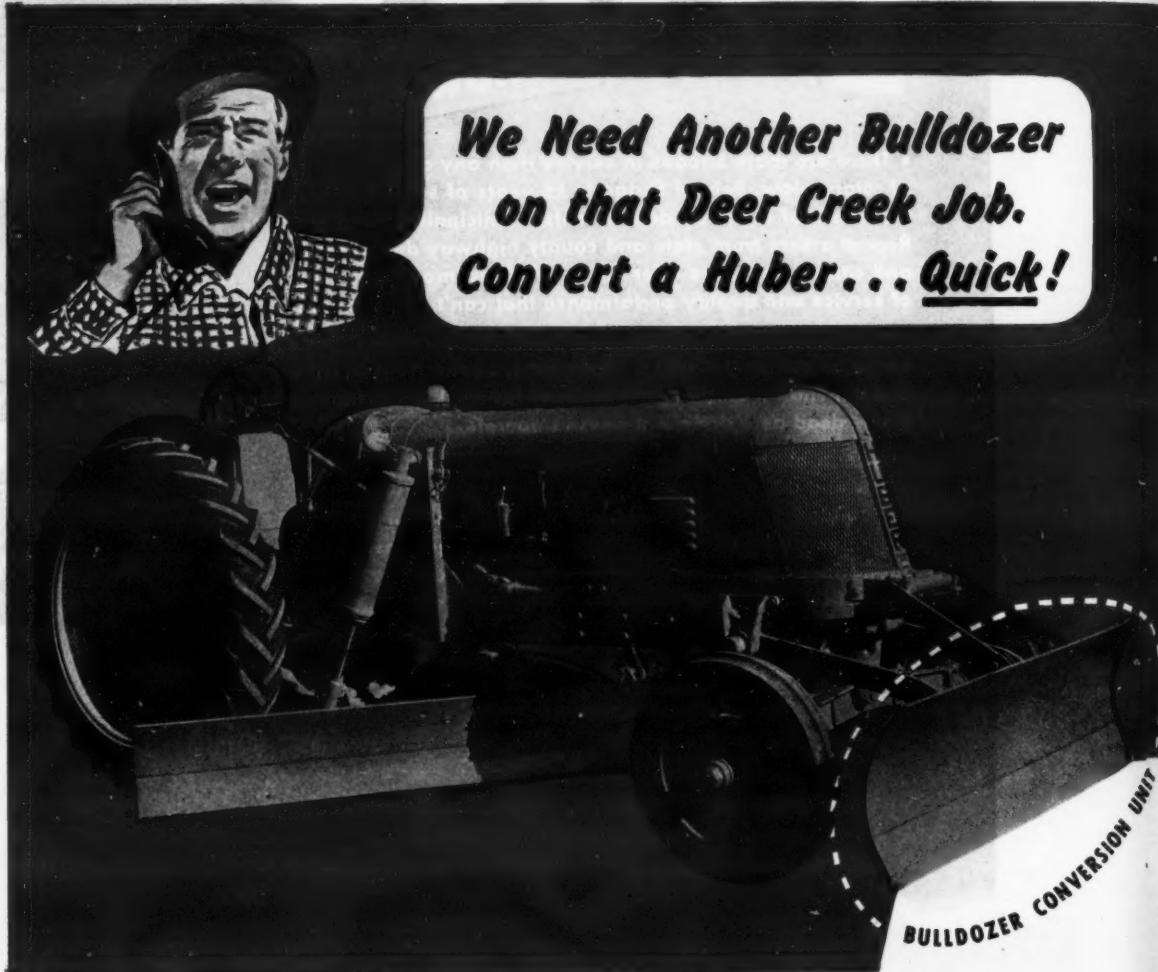


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HUBER 3 WHEEL & TANDEM ROLLERS
YEAR 'ROUND MAINTAINER

Avoid Legal Pitfalls

(Continued from preceding page)
 does appear that the collapse was not caused by Sanctis, and was caused by someone on the surface *** under the control of the Authority. * * * The Authority knew when it took bids that this section was less than a foot below the surface. If it wanted a sewer covered with a concrete arch, it could have specified that and paid the contractor therefor. The specifications made no such requirement and it is not now within the power of the Authority to place such an uncompensated burden on the contractor."

Wage-Hour Law Does Not Apply to Navy Facilities

Remembering that judges are supposed to interpret, not make, law, decisions recently rendered by two United States District Judges seem to be sound, although they draw distinction which might not be approved by old man "Horse Sense". The decisions are subject to review by the United States Supreme Court or the United States Circuit Court of Appeals.

The holdings are to the effect that the construction of facilities for the exclusive use of the Navy does not constitute construction of "instrumentalities of commerce", within the meaning of the Federal statutes regulating wages and hours of labor. And, in each case, it was ruled that materials used on the Navy ship in question had come to rest in the state where the work was being done, before being used—that is, had ceased to be in interstate commerce—so the men working on the ship were not brought within the Wage and Hour Law on a theory that they handled materials moving in interstate commerce. In one case, *Ritch v. Puget Sound Bridge & Dredging Co.*, 60 Fed. Supp. 670, Judge Bowen of the United States District Court for the Western District of Washington pointed out that, under the Constitution, "Congress has power to deal with the subject only insofar as it relates to interstate commerce". The suit was brought on overtime wage claims based upon the Wage and Hour Law, but was dismissed on the ground "that the dock and dock structures which were being built by the plaintiffs as employees of the defendant were not instrumentalities of commerce, that they were intended only to be a Navy dock for the exclusive use of the U. S. Navy, and that such dock was not intended to be used for all commercial vessels which might wish to do so in the ordinary course of trade and commerce".

Judge Bowen added that the work done in connection with the materials which had previously moved in interstate commerce, all of which was done after the materials came to rest on the premises of the Navy Department in Bremerton, after the materials had completed their movement in interstate commerce, does not affect, relate to, or constitute a part of, the movement in commerce of those materials" within the meaning of the law.

Judge Bowen manifested reluctance to deny workers the benefits of the Wage and Hour Law which would have been theirs if they had been working on a dock to be used for commercial purposes. He noted that such equity as exists is to be corrected, if at all, either by a controlling interpretation of the law, to be made by the United States Supreme Court, or by Act of Congress.

The opinion in this case distinguishes a case decided by the United States Circuit Court of Appeals, Sixth Circuit (*Walling v. Walton-Tulley Transportation Co.*, 134 Fed. 2d 945). In that case, it was decided that the Wage and Hour Law applied to employees of a government contractor engaged on dike and levee construction on the Missouri and Mississippi Rivers. "There," observes Judge Bowen, "it was clear that the facilities which were being constructed were facilities in aid of navigation and commerce along the navigable rivers upon which was being moved much of the nation's general interstate commerce."

In the case of *Brue v. J. Rich Steers*, 60 Fed. Supp. 668, Judge Goddard of the United States District Court for the Southern District of New York decided that the Wage and Hour Law did not apply to an inspector who supervised pouring of concrete into underwater forms for a Navy dry dock in the East River. Judge Goddard's reasoning is substantially to the same effect as Judge Bowen's.

Increased Wages Make Federal Gov't. Liable

A Federal construction contract required that workers on the job be paid specified hourly wages and permitted adjustment of wages by administrative authority, but specified that no extra compensation would be allowed if the contractor paid more than the rates stated in the contract. Under these circumstances, the New York Court of Claims decided that the Government, by implication, had represented to the contractor that

contract that neither party will hinder the other in his discharge of the obligations imposed upon him, nor increase his cost of performance."

On behalf of the Government, it was pointed out that its Contracting Officer and the Public Works Administrator had been constituted arbiters of all labor disputes arising under the contract, and that they had ruled against the contractor's right to increased compensation. Replied the Court of Claims:

"The defendant's position, otherwise stated, is that the parties agreed in advance of the

dispute to waive their right to sue for this breach of the contract and to leave the final determination of the controversy to the decision of one of the contracting parties.

"We do not think the parties intended article 15 to have such broad scope. If they did, it is clearly illegal under numerous decisions of the Supreme Court of the United States and of other Federal courts and of the state courts. It has long been settled that any agreement made in advance of the controversy which deprives a party of recourse to the courts is contrary to public policy and, therefore, void."

it would not do anything which would increase the cost of doing the work and was, therefore, liable insofar as it did increase the cost by raising the wages to be paid by the contractor. (*Beuttas v. United States*, 60 Fed. Supp. 771.) Said the Court of Appeals:

"It is an implied condition of every con-

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Maintains positive tension at all times sufficient to steady a clam shell bucket under any conditions. Functions perfectly with boom at any angle.

Operates on a spring principle. There are no weights, tracks, pins or carriages to wear out or get out of order. Large bearing and fewer sheaves save wear on cable.

Tagline is complete with fairlead and cable attached. Can be installed in less than one-half hour.

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Latin Americans Visit U. S. to Study Roads

Four distinguished South American highway engineers are at present guests in the United States, under the auspices of the Office of Inter-American Affairs, the American Road Builders' Association, and the Public Works Administration. They will visit the principal manufacturers of road-building machinery, and will study various highway construction projects during their three-month stay.

The visitors are Oscar Risopatron Berredo and Ernesto Berrios Waidele, Chief Engineers in the Chilean Highway Department, in charge, respectively, of its Maintenance and Equipment-Materials Departments; Luis A. Mino, Highway Department Chief Engineer for Ecuador, and Jorge Lopez V., Chief Engineer for the Public Works Department of the City of La Paz, Bolivia.

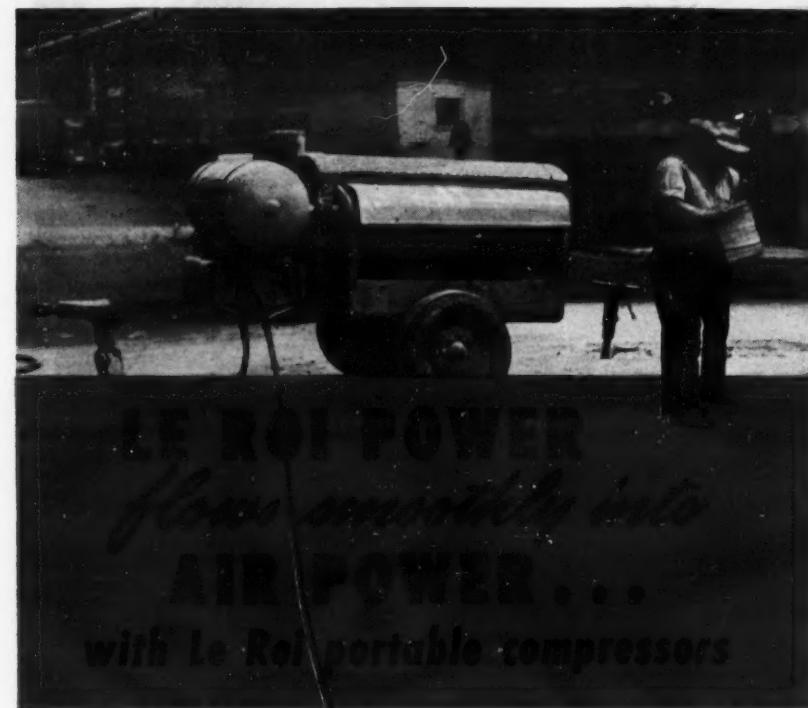
Señores Risopatron and Berrios report that an appropriation of about

\$6,000,000 for highway work is included in the 6-year program of public works outlined by their country. Within that period, Chili expects to invest at least \$5,000,000 in the purchase of road-building machinery and asphalt. Much of the equipment is desired as soon as possible. About \$10,000,000 annual revenue from gasoline taxes is seen by Chili as a permanent income, and will be devoted to airport and highway construction.

Ecuador also needs much road-building machinery, Señor Mino says, and \$1,480,000 has been appropriated from funds at hand for the immediate acquisition of needed equipment.

Krampe Joins Rodgers

Hugh Krampe, former Manager of the Industrial Marketing Division for Manning, Maxwell & Moore, Inc., has been named General Sales Manager by Rodgers Hydraulic, Inc., Minneapolis, Minn., manufacturer of hydraulic equipment.



Le Roi Engines and Le Roi Compressors make a smooth-running team because they are designed to work together—and both are manufactured to the precision standards of an engine-builder specializing in the heavy-duty field. Le Roi Compressors are the *only* ones in which both engine and compressor are built by the same manufacturer.

These Le Roi features "pay off" in long time, low-cost service

This combination gives you the easy-maintenance features of Le Roi Engines...reducing "downtime" and cutting your maintenance costs—the smooth, vibrationless operation—the economical, dependable power that has made Le Roi Engines the standard on many leading makes of

construction, industrial, and oil-field equipment.

It also gives you the many compressor improvements developed by Le Roi engineers...for example, safe, speedy towing to and from the job site—plus quick, easy on-site "spotting," so that your air power goes into action faster and you finish sooner.

A complete line to fit your needs

Le Roi Compressors are available from 60 to 315 c.f.m., gasoline-powered—105 to 500 c.f.m., Diesel-powered—on mountings to meet your individual requirements. Make all the comparisons you can think of—then equip with Le Roi's, for air power that sets a new standard of performance and cost. See your nearby Le Roi distributor.

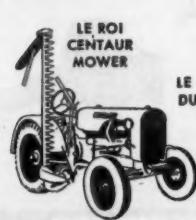
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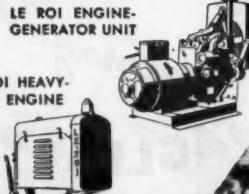


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Ohio Dealer Expands

Carrying through its postwar expansion program, the Gibson-Stewart Co., equipment dealer of Cleveland, Ohio, recently acquired new quarters at 11730 Harvard Avenue. The property has 30,000 square feet of floor space, with

2½ acres of land and a private railway siding.

The firm has also opened a branch in Columbus, at 146 So. Yale Avenue. Vernon S. Latimer, former Treasurer of the Warren Refining Co., has been named Personnel and Office Manager of the Gibson-Stewart organization.

Hand Puddling Can't Compete

with a **Mall**
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CONCRETE VIBRATOR

A Size and Type
For Every Job!

Fewer hands—faster placing—stiffer mix—uniform strength and density—better bond with reinforcement—no voids or honey-combs—these are just a few of the advantages you get with a Mall Concrete Vibrator.

When it is not being used to vibrate concrete, the Mall Vibrator can be adapted to Surfacing, Form Sanding, Wire Brushing, Grinding and Drilling. These attachments for these operations are easily and quickly interchanged with the vibrating element.

1½ H.P. Gasoline Powered model available, also 3 H.P. round base or wheel barrow mounting, 1½ H.P. Universal Electric and 7500 r.p.m. Pneumatic Units. Ask your distributor for Mall Concrete Vibrators, MallSaws, Mall Chain Saws and Mall Drills or write for literature and prices.

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Two 1946 Three-Wheel Rollers
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Model VM-31 10-ton
Model VM-32 12-ton

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Write or call your Buffalo-Springfield dealer today.

Watch for announcement of the 1946
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BUFFALO-SPRINGFIELD

The Buffalo-Springfield Roller Co.
Springfield, Ohio

The Oldest and Largest Builder of Road Rolling Equipment in America

Field Repair Shops For Big Airport Job

Contractor Sets Up Group Of Buildings to Keep Large Amount of Dirt-Moving Equipment Running

TO keep the construction equipment for a 9,000,000-yard grading job in good operating condition, Harrison Construction Co. of Pittsburgh, Pa., contractor for the Kanawha Airport at Charleston, W. Va., (see page 19), established field repair shops close to its office at the west end of the airport near the junction of runways 1 and 2. Three buildings house the shops, one for truck repairs, another for tractor repairs, and the third for electrical work and for charging batteries.

The truck repair and machine shop was the first of the three erected, being built late in 1944 when the initial grading operations got under way. It is a roughly built structure, 40 feet square and 15 feet high, with three rows of five wooden piles supporting a wooden roof and a wooden framework covered with canvas on three sides, with the fourth side left open for the trucks to enter. In the winter a canvas is let down over the open side, and the interior is warmed by a coal stove placed at the center row of posts which divides the building in half. The shop has a concrete slab floor.

Along each side was added a wooden lean-to having a height of about 7½ feet and connecting directly to the main building. The lean-to at the left of the entrance has a wooden work bench, running along the depth of the structure, on which radiators are repaired, the welding being done by a Hobart 100-amp electric welder mounted on a truck. This unit is parked at the side of the shop and its wires can be pulled out if a call comes for its use out where the equipment is working. There are also the regular oxy-acetylene welding units. A pipe line runs from the water storage tank to this shop to facilitate the testing of the radiators.

The lean-to on the right of the entrance also has a work bench, 20 feet long x 3 feet wide, equipped with a 6-inch vise and a Diehl bench grinder. Wooden cabinets beneath the bench contain the mechanics' tools. At the rear of the bench is a lathe, with a 12-inch swing and a 12-foot bed, driven by a G-E 5-hp electric motor. To eliminate the use of overhead belting for different rates of speed, a Chevrolet transmission with three forward and one reverse gear was rigged up to drive the lathe.

Next door is a small wooden shed, 5x12 feet, built on skids so that it can be pulled about by a truck or tractor and left in any location desired. Electrical work is performed here, batteries being left for charging on a Trojan battery charger, while on a work bench in the rear is a bench vise and a Western Electric tester for checking spark plugs, generators, coils, and other electrical parts. The building is heated by a small stove.

"BICKNELL BETTER BUILT"

PAVING BREAKER TOOLS

We manufacture a complete line of tools for pneumatic paving breakers, rock drills and diggers.

Write for descriptive circular

BICKNELL MANUFACTURING CO.
LIME STREET
ROCKLAND, MAINE

Tractor Shop

To the rear is the tractor shop, largest of the three buildings, being 80 feet wide and 30 feet deep, with a concrete floor and corrugated-metal walls and roof fastened to a framework of steel beams which are bolted together. This shop is portable and can be dismantled, moved, and set up in another location in a short time. Suspended from the steel-truss roof framing and running on a rail the full width of the shop is a Yale 3-ton hoist, which is used chiefly for lifting out parts of tractors to be repaired and placing them on 6 x 4-foot wooden tables, of which there are three or four throughout the center of the shop. These tables are large enough for the big tractor engines which are repaired here.

In the front wall are four 14 x 14-foot sliding doors, adequate to accommodate the larger pieces of equipment, while at the opposite or rear wall are four wooden work benches with metal tops, 12 feet long x 3 feet deep, with cabinets beneath for mechanics' tools. In the wall above the benches is a row of windows furnishing natural light for the mechanics working on small parts, and distributed overhead are twelve electric lights for additional illumination. The building is supplied with steam heat from a Mead-Morrison 20-hp coal-burning boiler, which also heats the administration office of the contractor.

Besides engine repairs, this shop overhauls transmissions and rear ends of tractors, and does a considerable amount of welding on both tractors and scrapers. In a rear corner is a Lincoln 400-amp electric welder, which among its varied uses is employed to make copper welds in cast-iron equipment parts. This rather unusual operation requires a definite skill on the part of

the welders, particularly in not supplying too much heat. In addition to the shop welding, many pieces of equipment are repaired out in the field, if a break occurs, by rushing a mechanic with a welding outfit to the scene of the trouble. Units for this work include a Lincoln 300-amp welder on a 2-wheel chassis, and three Westinghouse 200-amp electric welders mounted on trucks.

Other equipment in this shop includes a 20-ton hydraulic press, a bench vise for each work bench, a Thor ¾-inch electric drill, a buffer-grinder, a Barrett brake-lining and grinding machine, and a Black & Decker valve-refacing machine. The problems encountered in making quick repairs to keep equipment functioning developed some ingenious devices in the shop. One such tool, made from three pieces of angle iron with a ¾-inch plate having a hole in the center fastened at each end, is used to keep compressed the track adjustment spring on a crawler tractor when renewing a broken bolt. The

(Concluded on next page)



Compressed Air...

EVERY TIME THE BUTTON IS PUSHED!



All you have to do is push a button . . . and get all the air you need with a Schramm Air Compressor!

This is a feature worth having in an air compressor. In addition, Schramms are lightweight, easy to move about, and are 100 per cent watercooled to provide ideal performance both summer and winter.

Four Schramms were used on the road construction job illustrated above. It is only one of many jobs where Schramm was specified to do the job. Air obtained easily . . . constantly . . . that's what makes your construction job easier. If you use compressed air, it will pay you to write for descriptive literature and details.

SCHRAMM INC.

THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

Field Repair Shops For Big Airport Job

(Continued from preceding page)

triangular-shaped plates at each end confine the spring while the nut is being cut off and a new bolt and nut put in place.

Servicing Equipment

Besides the rubber-tired earth-moving equipment, the contractor has on the job twenty-two trucks of assorted makes from $\frac{1}{2}$ to 5-ton size. To keep all these tires inflated, three trucks were outfitted with Ingersoll-Rand air compressors which are also used to furnish power to greasing units. During the day the scrapers are called off the earth-moving line one at a time for greasing and servicing by these trucks equipped with air compressors and grease guns. The bulk of the greasing, however, is done by a crew of five men who work through the night from the time work stops for the day until it is

resumed the following morning. To keep the equipment running, several 500-gallon tanks of fuel oil were mounted on wooden skids and are pulled around the job site to refuel the trucks and tractors.

Personnel

These field repair shops of the Harrison Construction Co. are under the direction of Tony Albenzo, Superintendent of Shops. M. W. Wise is General Superintendent on the Kanawha Airport project.

New Bendix Plant

A new factory, to be four times larger than all of the present buildings in the division, is being built by the Bendix Aviation Corp. at its Marshall-Eclipse Division, Troy, N. Y. The plant will produce brake linings for post-war passenger cars and trucks when it begins operating next spring. To cost more than \$500,000, the factory will provide about 80,000 square feet of

space, and will be devoted to all of the division's fabrication and manufacturing operations. One of the two present plants will be remodelled to provide new offices and an enlarged research and engineering department; the other will be used for storage.

Reclamation Post Filled

The appointment of Richard L. Boke to succeed the late Charles E. Carey as Director of Region II has been announced by the U. S. Bureau of Reclamation. Region II embraces the Central Valley Project in northern California, and a part of Oregon, with headquarters at Sacramento, Calif. As Supervisor of Operation and Maintenance in this region during the past eight months, Mr. Boke has been active in planning the resumption of construction on the half-completed Central Valley Project. His previous experience includes the position of Assistant Regional Director in the Soil Conservation Service.

A BETTER METHOD OF HOLDING WIRE ROPE

Securely!

MILLIONS IN DAILY USE
BY THE ARMED FORCES
AND THOUSANDS OF
MANUFACTURERS



SAFE-LINE WIRE ROPE CLAMP

Eliminates Splicing and Serving

Much faster—saves time—reduces cost. Minimizes rope or sling breakage. Holds tight thimble.

Easy to Use, Easy to Re-adjust

No highly skilled labor or special tools required. Easy to adjust as rigging stretches.

Outpulls Strongest Rope

$\frac{3}{8} \times 6 \times 19$ Improved Plow Steel Wire Rope broke at 46,850 pounds on Riehle Tension Machine. SAFE-LINE Clamp held.

Economical—Use Many Times

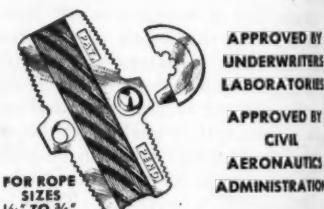
Thousands of the first SAFE-LINE Wire Rope Clamps made are still in use. Low initial cost.

Prevents Injury, Mental Hazard

Exposed needle-sharp wire ends safely enclosed inside of clamp protects against cutting or scratching hands and arms. Smooth rounded shape prevents catching clothing or fouling.

Replacement Guarantee

Every SAFE-LINE Wire Rope Clamp carries a replacement guarantee against breakage and fracture.



APPROVED BY
UNDERWRITERS
LABORATORIES
APPROVED BY
CIVIL
AERONAUTICS
ADMINISTRATION

Never Slips

FORGED AND MASTER COINED TO FIT ROPE
Double spiral splines fit each wire and strand, provide a perfect, secure GRIP on rope. Pressure equally distributed over large area eliminates cutting action. Locking lugs automatically line-up threads.

WRITE FOR
DESCRIPTIVE PRICE LIST FOLDER

NATIONAL PRODUCTION COMPANY

4559 ST. JEAN AVENUE • DETROIT 13, MICHIGAN

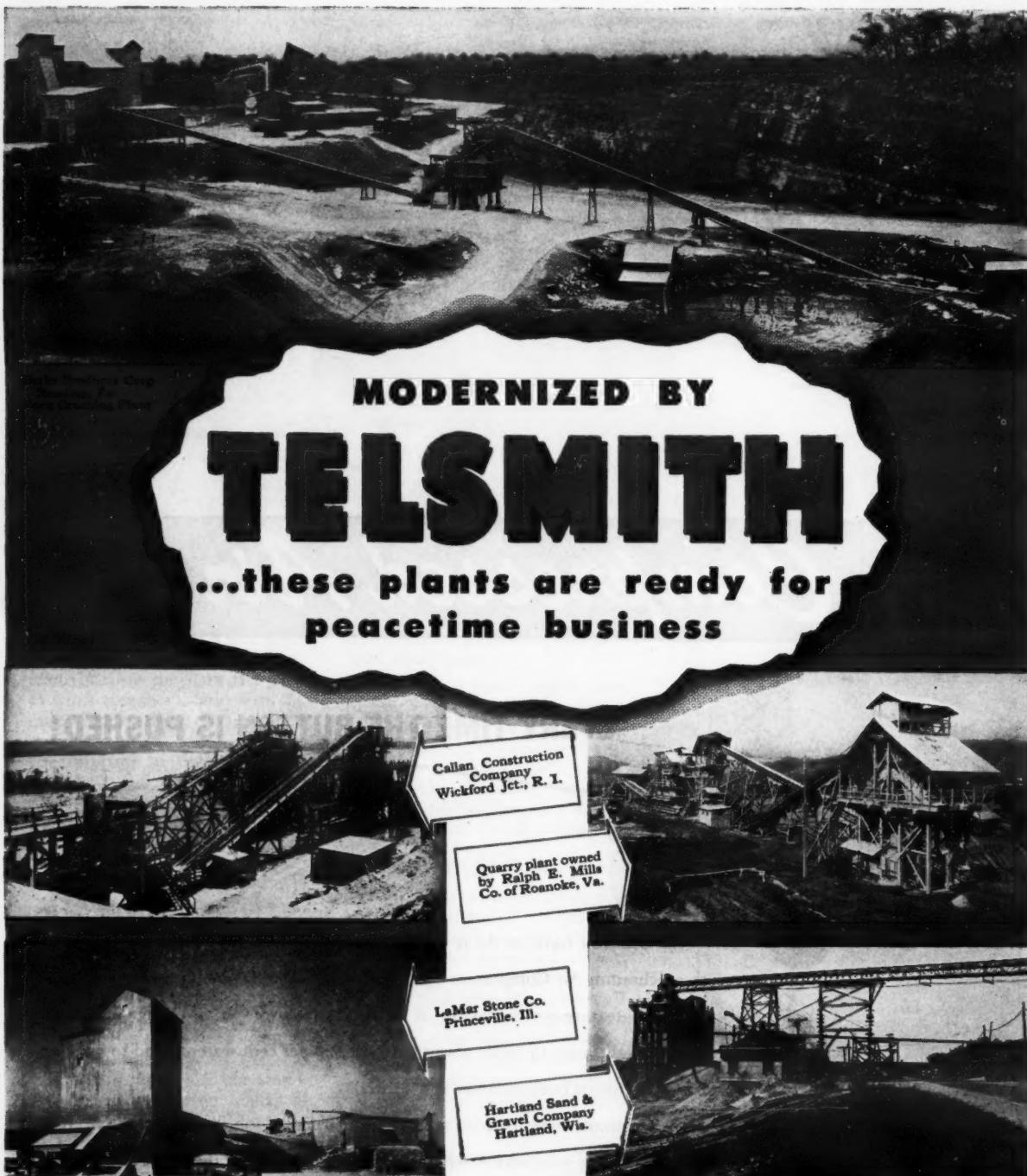
Contractors' Equipment For Sale

- One—Allis-Chalmers Model "WK" Tractor complete with Baker (Rebuilt and Guaranteed)
- One—Allis-Chalmers Model "WK" Tractor complete with Gar Wood Bulldozer.
- One—Allis-Chalmers Model "L" Tractor complete with Baker Bulldozer.
- One—Monarch 75 Crawler Tractor complete with Continental Hydr. Bulldozer.
- One—Gar Wood Attachment for connecting Hydr. Bulldozer into Trailbuilder Unit (Slightly Used)
- One—Gorman Rupp Triplex Model R Road Pump mounted on four steel wheels.
- One—Sullivan 105-ft. Portable Air Compressor complete with four pneumatic-tired wheels.
- One—Worthington 105-ft. Portable Air Compressor complete with two pneumatic-tired wheels.
- One—Hobart 300-Amp. gasoline engine driven Arc Welder complete with 3-kw aux. generator all mounted on four pneumatic-tired wheels.
- One—Multi-footed 27E Paver complete with 18-ft. boom.

LAKESHORE

MACHINERY & SUPPLY

400 W. Laketon Avenue,
Phone 26-6555
Muskegon, Michigan



The operators of these plants were prepared for changed markets, new demands and keener competition. These plants are Telsmith-modernized! Re-arrangement, and the right Telsmith equipment for larger capacity and greater flexibility have cut costs and boosted output. Smaller sizes, in the right quantity and quality, to meet

market demands, can now be produced profitably!

Plan your modernization, expansion, or new plant now. Telsmith's 40 years of engineering know-how in plant-designing and equipment-building is at your disposal. Consultation without obligation.

Get new equipment Bulletin E-34.

MP-58

SMITH ENGINEERING WORKS, 4014 N. HOLTON STREET, MILWAUKEE 12, WISCONSIN

51 East 42nd St.
New York 17, N.Y.

211 W. Wacker Drive
Chicago 6, Ill.

Cable Addresses: Seagulls, Milwaukee—Concrete, London
713 Commercial Trust Bldg.
Philadelphia 2, Pa.

247 Third St.
Boehk Expt. Co.
Cambridge 42, Mass.

Mines Eng. & Expt. Co.
Milwaukee 3, Wis.
San Francisco 4—Los Angeles 14

Brands M. & S. Co.
Louisville 8, Ky.

Rish Equipment Co.
Charleston 22, and Clarksburg, W. Va.

Rish Equipment Co.
Roanoke 7, & Richmond 10, Va.

North Carolina Expt. Co.
Raleigh and Charlotte 1, N.C.

Wilson-Weesner-Wilkinson Co.
Knoxville 8, and Nashville 6, Tenn.



The first use of a manually operated bridge to apply Tru-Cure concrete-curing compound was on the Bridgeport Core & Sand Co. section of the Detroit Expressway.

Membrane Cure Applied With Multiple Sprays

Any membrane concrete-curing compound, in order to provide water retention to meet engineers' specifications, should be applied at a rate of not more than 200 square feet of concrete per gallon of the compound. A spray at the end of a long pipe, which is the way the material was first applied, is good method of application, but obviously, the inspector has inadequate assurance that the concrete is being covered with a uniform film.

A multiple-nozzle spray machine properly shielded against strong drafts and with the nozzles of such type and so arranged as to provide a uniform 6-foot width of spray at one pass of the machine has been developed by the Truscon Laboratories, Milwaukee Junction Post Office, Detroit, Mich. This machine is mounted on a bridge which, by means of a ratchet and hand crank, may be advanced by the operator, the necessary distance for the next traverse of the machine across the roadway. This machine, working back and forth, makes up a one-man spraying outfit, which is able to keep up with the finishing operation and still leave the operator enough time for odd jobs.

Complete information as well as the price of the Tru-Cure multiple-spray applicator may be secured direct from the manufacturer.

Safer Truck Winch

Greater safety and easier loading of heavy machinery and materials are claimed for a new-type power winch made available by the Fruehauf Trailer Co., 10928 Harper Ave., Detroit 32, Mich. Developed by the firm for use in its own trucks and trailers, it has seen extensive service before being released for general usage.

Built as a compact unit so as to be easily mounted on trucks or trailers, the winch is available in three sizes, having capacities of 12,000, 18,000, and 30,000 pounds. Power is supplied by the truck engine, with three convenient operating levers located within the cab. Each model has an oil-cooled, adjustable automatic brake for safety,

**PRECISION AIRCRAFT ENGINE PARTS
COMMERCIAL HEAT TREATING**

**SEASONING OF STEEL
NITRIDING—A SPECIALTY**

**CADMUM, ZINC, TIN and
HARD CHROME PLATING**

GRINDING

**DESIGN—MANUFACTURE
UNIVERSAL JOINTS**

**METALLURGICAL LABORATORIES
ENGINEERING DIVISION***

AKERSTRAND CORPORATION

Muskegon, Michigan

Sales Office: 1402 Kales Bldg. Detroit 28, Mich.

Textbook on Bearings

Written as a fundamental textbook on all phases of bearing applications in industry, a 270-page volume, "Ball and Roller Bearing Engineering", has recently been published. The book contains some 900 drawings and tables, and goes from a technical description of common bearing types through nine chapters of fundamental engineering studies. Dr. Arvid Palmgren, well known for his activities in the bearing engineering field over a 30-year period, is the author.

Radial and thrust bearings are discussed in Chapter 1, which presents data on dimensional proportions, running accuracy, and tolerances of each type. "Forces and Motions in Bearings", the second chapter, is devoted to theory and calculations on such subjects as the nature of roller resistance, friction torque, friction coefficients, stresses and deformations, load distribution, motion and inertia. Other chapters deal with studies in the carrying

capacities of bearings, selection, design of applications, mounting and dismounting, lubrication, etc.

The first edition of the book is being sent to technical schools and colleges, libraries, and the heads of leading corporations. Later editions will be made available at cost to readers of CONTRACTORS AND ENGINEERS MONTHLY and others interested in bearing studies. Mention this review when writing SKF Industries, Front St. & Erie Ave., Philadelphia 24, Pa.

Heavy Traffic in East

Travel conditions throughout New England are chaotic, our Eastern Field Editor, William H. Quirk, reports. Traffic meters showed a 150 per cent increase in traffic on New Hampshire roads during September of this year as compared to September, 1944, according to LeRoy F. Johnson, State Maintenance Engineer. Mountain travel in upper New England already exceeds that of pre-war days.



National Safety Council Photo

The worker pictured here foolishly stood between the two machines when attempting to insert a coupling pin behind a tractor.

Construction Safety Subject of New Film

Accidents on construction jobs resulted in the death of 1,800 workers during 1944, giving the industry the second highest fatality rate of all major industrial groups. Though construction employed only 2 per cent of the nation's workers, it had 10 per cent of the total number of worker deaths resulting from accidents last year, a rate nearly 4½ times greater than the average for all industrial groups.

To aid in reducing this unnecessary waste of life, the National Safety Council has produced a sound slidefilm on accident prevention. This film, "Construction Equipment Safety", covers the causes of most accidents in the use of bulldozers, cranes, tractors, shovels, dump trucks, and such equipment. Following a few simple rules and the application of common sense are the most effective means of preventing these accidents, the film stresses.

A manual for use in quizzes and group discussions of the points shown in the film has also been prepared by the Council. Further information on the availability of the film may be obtained from the National Safety Council, 20 No. Wacker Drive, Chicago 6, Ill.

Heavy-Duty Shovels Have New Features

Features developed from wartime experience are incorporated into four new heavy-duty excavators announced by the Thew Shovel Co. Designated as the Lorain 41 Series, the line consists of a chain-drive crawler and three rubber-tired machines.

A mounting longer, wider, and heavier than heretofore is provided in the new crawler unit. Steered from the cab, with the boom in swing position, the machine can do ¾ and 1⅓ mph in either direction. It has 30-inch standard treads, and a newly developed tread and travel lock of the positive 4-way ratchet-and-pawl type. The machine is convertible to shovel, crane, dragline, clamshell, or back-digger service.

Two Moto-Cranes, each of 20-ton capacity, are included in the new series. The 4-wheel-drive model, with a specially designed 6-wheel carrier for shovel and crane loads, has ten forward and two reverse speeds, and a speed range up to 28 mph. Two worm-driven axles supply power to the dual-tire rear wheels, which are equipped with air brakes. The 6-wheel Moto-Crane has a double-reduction drive on all axles, eight forward and two reverse speeds, and a 31-mph traveling speed. It has air brakes, and air-power-assisted steering.

The 41 Self-Propelled crane, of the single-engine single-operator type, is powered by four worm-driven rear wheels, and has four speeds ranging up to 7 mph in either direction. The hoist, swing, travel, and boom derrick may

be effected simultaneously. It has dual-tired front wheels of the differential type to eliminate scuffing. Steering is air-powered, and the rear wheels have air brakes. The machine has a 20-ton capacity.

Readers of CONTRACTORS AND ENGINEERS MONTHLY may obtain further information by mentioning this story when writing the Thew Shovel Co., Lorain, Ohio.

New Cummins Manager In Fort Worth Office

James G. Hull, formerly home-office Sales Engineer in charge of all oil-field accounts, has been named to succeed Jay B. Chambers as Manager of the Fort Worth office of the Cummins Engine Co., Inc., Columbus, Ind., manufacturer of diesel engines. This office, which serves the entire mid-continent area, is located at 1812 Fair Building, Fort Worth 2. Mr. Chambers resigned recently to purchase the Cummins dealer franchise in Denver.

New Line of Holders For Carbon Electrodes

A new line of air-cooled carbon-electrode holders for manual welding has been announced by the Tweco Products Co., English & Ida Sts., Wichita 7, Kans. Four sizes are included and the positive Hol-Grip design gives ample length and ventilation to the holder. The 13½-ounce 150-amp size

and a 20-ounce 200-amp unit, both suited for average carbon arc welding, have as optional equipment a Quick-Attach whip cable for use on jobs of short duration. Heavy welding and cutting is done by the 300 and 500-amp sizes.

Further details, and Form CH-100 which describes these holders, may be secured by writing Tweco and mentioning this news item.

IMMEDIATE DELIVERY

UNIVERSAL Level-Transit

Telescope 12" long, 25 power—Horizontal Circle 4½" with vernier to 5 minutes—Vertical Arc 3"—Clamp and Tangent Screw for Vertical and Horizontal Limb—Instrument weighs 11 pounds, tripod 9 pounds.
Price complete with Tripod, Carrying Case, Sunshade, and Dust Cap \$115.00. Can be furnished with a compass at \$12.50 extra—Stadia Wires \$5.00 extra.

ORDER BY MAIL

Expert Repairing of All Makes of Instruments

FREE Interesting Book—"How to Layout Building Lots"—Free—Write Today

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THIS "LIVE BOOM" PAVER LOWERS COSTS



Let's consider the unique advantages of the boom on a standard 34-E Ransome Blue Brute "Dual Drum" Paver to see why you can lay more yardage . . . more accurately . . . with less manpower . . . than with any other paver.

Because this boom is really a "live boom" just like your crawler crane, it can be power-elevated to allow 9 ft. clearance under the bucket. And the paver can be operated continuously with the boom in the elevated position.

Think what that means. Whenever you want, or as often as you want, you can concrete retaining walls, abutments, headwalls, etc. in one operation at the same time you lay the slab. You

eliminate the extra expense of doing those operations separately.

Moreover, because this "live boom" spreads as it swings it covers wider area with each batch . . . cuts down on costly hand shoveling.

OTHER BLUE BRUTE PLUSES

In addition, a Blue Brute "Dual Drum" Paver has the fastest-charging, self-cleaning skip . . . hydraulically-controlled bucket, eliminating split batches . . . metal-to-metal spiral cut-off for precise water measuring . . . mechanically-operated batchmeter for all-season accuracy. These and other features are described in detail in Bulletin 208. Write for it.

24RS-3

BUY BLUE BRUTES



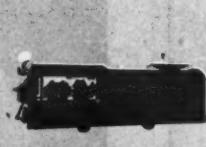
Truck Mixers
Capacities:
2, 3, 4½, 5½ cu. yds.



Portable Mixers
Capacities:
3½, 7, 10, 14 cu. ft.



Big Stationary Mixers
Capacities:
28, 56, 84, 126 cu. ft.



Pneumatic Placer
Capacity:
7, 14, 28 cu. ft.

WORINGTON



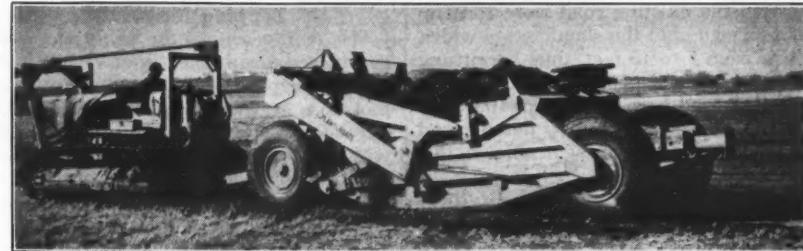
Worington Pump and Machinery Corporation, Worington-Ransome Construction Equipment Division, Holyoke, Mass.

**Postwar Products

New 8½-Yard Scraper With Cable Control

Design features developed and proved over a period of two years of field tests have been incorporated in a new 8½-yard scraper of the front-dumping forced-ejection type now available from the LaPlant-Cheote Mfg. Co., Inc., Cedar Rapids, Iowa, manufacturer of earth-moving equipment. Capable of handling 11 cubic yards heaped, the scraper is 27½ feet long, 10 feet 5 inches wide, 7 feet 8 inches high, and weighs 14,500 pounds.

Featured in this new model, C-108, is a floating apron which opens 30 inches before the rear gate moves, permitting adjustment of the apron to any position before loading. Compaction of the load between gate and apron is prevented, as the apron clears the load completely when the rear gate begins to move forward. The open-top bowl, characteristic of LaPlant-Cheote scrapers, allows loading by shovel, dragline, or elevating grader, if desired. The



The new LaPlant-Cheote scraper of the front-dumping forced-ejection type has a struck-load capacity of 8½ yards.

high lift of the apron enables the scraper to discharge any type of material from the bowl, including rock and sticky gumbo.

A new arrangement of the sheave mechanism for the operating cable and design of the linkage makes for easier dumping and less utilization of tractor horsepower, the firm says. The front-dumping forced-ejection design is said to facilitate spreading, which is possible from ½ to 18 inches. Cam action on the lift cable permits rapid raising or lower-

ing of the bowl, making possible quicker pumping action in handling sand, gravel, and other loose material.

In digging and loading, the rear wheels are inside the cut at all times, yet effective side-slope work is possible because of the scraper's low center of gravity, it is stated. The scraper has a ground clearance of 14 inches. The power control requires less braking power to carry the load as the cam action on the bowl lift is so arranged that the cable, in hauling, is closer to the

center of the axle on the sheaves. Other LaPlant-Cheote characteristics incorporated into the C-108 are deep box-plate sections, welded construction, special steel for lighter weight but maximum strength, reversible cutting edge, and tapered roller bearings for the wheels. There is a choice of three tire sizes.

Complete information, including prices, may be secured by writing direct to the manufacturer and mentioning this illustrated news story.

Building-Materials Supply

For \$7,000,000,000 Volume

The supply of building materials and equipment next year should be sufficient to permit the volume of new construction to exceed \$7,000,000,000, provided production is not unduly delayed by wage and pricing problems, James W. Follin, Managing Director of the Producers' Council, told the group at its recent three-day meeting in Cleveland.

Worthington-Ransome Blue Brute Distributors

By referring to the advertisement on page 64, you'll learn the meaning of the (1), (2) or (1-2) beside their names.

Ala. Birmingham (1-2) J. D. Pittman Tractor Co.
Ariz. Phoenix Lee Redman Co.
Phoenix (2) Smith Booth Usher Co.
Ark. Fort Smith (1) E. B. Young & Son
Little Rock (1) Kress-Limerick, Inc.
Little Rock (2) H. A. Young & Son
Calif. Los Angeles (1) Garlinghouse Bros.
Los Angeles (2) Smith Booth Usher Co.
San Francisco (1-2) Coast Equipment Co.
Colo. Denver (2) John N. Meade
Denver (1-2) Power Equipment Co.
Conn. Hartford (2) The Holmes-Talcott Co.
New Haven (1) W. I. Clark
Waterbury (1) Contractors Supply Co.
D. C. Washington (1) M. M. Dutch Machinery Co.
Fla. Miami (1) Allied Equip. Inc.
Tampa (1-2) Epperson & Co.
Orlando High Equip. & Supply Co. (1-2)
Ga. Atlanta (1-2) Tractor & Machinery Co.
Savannah (1) Morgans, Inc.
Ida. Boise (1-2) Olson Manufacturing Co.
Ill. Chicago (1-2) Chicago Construction Equipment Co.
Chicago (1-2) John A. Roche
Chicago (1) Thomas Hoist Co.
Ind. Fort Wayne (1) American Steel Supply Co.
Indianapolis (2) Reid-Holcomb Co.
Iowa Des Moines (2) Des Electric Equip. & Const. Co.
Ky. Louisville (2) Hall Equipment Sales Co.
Louisville (2) T. C. Coleman & Son
Louisville (2) Williams Tractor Co.
Paducah (1) Henry A. Petter Supply Co.
La. New Orleans (1) Ola K. Olson Co.
New Orleans (2) Wm. F. Surgi Equipment Co.
Maine Portland (1-2) Maine Truck-Tractor Co.
Md. Baltimore (1) Stuart M. Christoffel & Co.
Baltimore (2) D. C. Elphinstone, Inc.
Mass. Boston, Allston (1-2) Clark-Wilcox Co.
Cambridge (2) Field Machinery Co.
Mich. Detroit (1) T. G. Abrams
Detroit (2) T. G. Abrams
Detroit (2) W. H. Anderson Co., Inc.
Flint (2) Granadine-Hall & Co.
Muskegon (1-2) Lakeshore Mach'y. & Sup. Co.
Minn. Minneapolis (1-2) Phillipi-Murphy Equip. Co.
St. Paul (2) D. L. O'Brien
Minn. Minneapolis (1-2) Jackson Road Equipment Co.
Jackson (1-2) Town-Son Equip. Co.
Mo. Clayton (1-2) The Howard Corporation
Kansas City (1) Brown-McCaus Corp.
Kansas City (2) Machinery & Supplies Co.
St. Louis (2) W. H. Reaves
Montana Billings (1-2) Interstate Truck & Equip. Co.
Helena (1-2) Card Eng. Works
Neb. Lincoln (1) Highway Equipment & Supply Co.
N. J. Hillside (2) P. A. Drobach
Newark (1) Johnson & Dealaman
North Bergen (2) American Air Compressor Corp.
N. M. Albuquerque (1-2) Bud Fisher Co.
Raton (2) Smith Machinery Co.
N. Y. Albany (1-2) Mutual Machinery Co.
Buffalo (2) D. D. & Co., Inc.
Buffalo (2) Smith Machinery Co.
New York (1-2) Air Compressor Rental & Sales
New York (1-2) Dodge & Hammond, Inc.
New York (1-2) Railroad Materials Corporation
Olean (2) Freeborn Equipment Co.
N. C. Raleigh (1) Smith Equipment Co.
N. D. Fargo (1-2) Smith Commercial Body Works, Inc.
Ohio Cincinnati (1-2) Fink Equipment Co.
Cleveland (2) S. C. Clarence
Cleveland (1) H. B. Fuller Equipment Co.
Cleveland (2) Gibson-Stewart Co.
Marietta (2) Northwest Supply & Equipment Co.
Toledo (2) M. W. Kilcorse & Co.
Oklahoma, Oklahoma City (1-2) Townsco Equip. Co.
Oregon, Portland (2) Andrews Equipment Service
Pa. Allentown (2) H. N. Crowder, Jr., Inc.
Easton (2) Sears & Bowers
Bethlehem (1-2) Amer. Equip. Co.
Oil City (2) Schaefer Equipment Co.
Philadelphia (1) Giles & Ransome
Philadelphia (2) Metalweld, Inc.
Pittsburgh (2) Atlas Equipment Corp.
Wilkes-Barre (2) Ensminger & Co.
Williamsport (1) Arrow Supply Co.
York (2) George V. Morris Sons
S. C. Columbia (1-2) Smith Equipment Co.
Tenn. Knoxville (2) Wilson-Wesmer-Wilkinson
Knoxville (1-2) Dempster Bros., Inc.
Tex. Dallas (1-2) Shaw Equipment Co.
El Paso (2) Equipment Supply Co.
El Paso (1) Mine and Smelter Supply Co.
Houston (2) Dye Welding Supply Co.
Houston (2) Call Tractor Equipment Co.
San Antonio (2) American Machinery Co.
San Antonio (1) San Antonio Mach. & Sup. Co.
Utah Salt Lake City (1-2) Landes Engineering Co.
Vt. Barre (1-2) A. M. Flanders, Inc.
Va. Richmond (1-2) Highway Machinery & Supply Co.
Spokane (2) Andrews Equipment Service
W. Va. Charleston (1) Clyde P. Beckner, Inc.
Fairmont (2) Interstate Engineers & Constr., Inc.
Wis. Milwaukee (1-2) Drott Tractor & Equip. Co., Inc.
Wyoming, Cheyenne (2) Wilson Equip. & Sup. Co.

LIKE A CHAMPION SKATER



FORM-SET ROPE

is relaxed

Ever watch a truly great skater? Ever watch him rocket down the straightaways, glide around the turns? He's graceful, swift, sure . . . a study in balance and smooth endurance . . . because he's relaxed.

You'll find much of that same relaxed quality in Bethlehem Form-Set rope. Form-Set rope is preformed; each wire and each strand is molded to its final helical shape before being laid in the rope. In this way many internal stresses and strains are relieved. Since the wires and strands are preshaped into their final form, they have no nervous urge to straighten themselves out. They do not fight to uncoil. The rope is relaxed.

Cut a section of Form-Set rope. You'll notice that not a single wire or strand pops loose from the rope. They all lie smoothly in place. To get them apart, you actually have to lift them out with your fingers.

What is the advantage of this relaxation? Clearly, it means easier handling. But more important still, it promotes longer life on jobs where bending fatigue is a serious item—and this includes practically all operating ropes.

Bethlehem furnishes every grade, size, and type with the Form-Set construction . . . the feature that relaxes wire rope.



Why a Form-Set (preformed) rope is relaxed. Preforming "sets" the wires and strands in their helical permanent shape, so that they have no tendency to fly apart, even when cut or broken.



When you think WIRE ROPE . . . think BETHLEHEM

Blue Brutes
Worthington Pump and Machinery Corp.
Worthington-Ransome Construction
Equipment Division
Holyoke, Massachusetts

Grading and Paving New 16-Mile Highway

(Continued from page 1)

artery of travel between Birmingham, Ala., and New Orleans. The Federal government is financing 75 per cent of the cost, with the remainder borne by the State and Sumter County furnishing the right-of-way.

Both contractors used scrapers or pans pulled by tractors for the extensive grading, totaling about 500,000 cubic yards of excavation, in widening the roadbed to accommodate a 22-foot concrete pavement with 8-foot shoulders. The sand-clay or gravel topping material, which was used to replace unsuitable soils in the base for the 8-inch plain-concrete pavement, was hauled from borrow pits in trucks. Grading started in the autumn of 1944 and was well enough along by July, 1945, to begin concrete paving which will be finished by the end of the year. The two Cobb contracting firms, composed of three brothers, merged their working forces and organized one crack concrete outfit to pave the total length of 15.86 miles on both contracts.

Western-Section Contract

Of the 7.4 miles on the western half of the project, from the state line to the town of York, about 75 per cent was constructed on a new location, eliminating several sharp curves in the old road which was used for traffic during construction. In one 2-mile section, however, where the old and the new routes coincide, the bituminous surface and

base of the existing road were torn up and thrown onto the shoulders to widen them from 8 to 16 feet, thus permitting traffic to travel along both sides while the new road was built down the middle. The lack of a nearby detour road necessitated maintaining traffic in this manner.

The prime contractor, Cobb Brothers Construction Co., retained only the concrete-paving item from its original bid, giving a subcontract for the drainage, grading, and topping material to C. O. Mitchell of Birmingham, Ala., who in turn subbed the culvert construction to W. B. Brantley of Decatur, Ga.

The bulk of the grading on this contract was in the relocation where the cut and fill were balanced. The earth was moved by three 14-yard and one 9-yard LeTourneau scraper, each pulled by a Caterpillar D8 tractor, which were helped in loading by a Caterpillar D7. The length of haul averaged between 400 and 600 feet, with about 3,600 yards being moved in a 10-hour day, one hour of which was lost by each unit because of repairs or part replacement occasioned by the use of old equipment which could not be replaced by new units. In the soft sand and clay material the tractors averaged an 8-mpm speed.

Compaction of the fill, which was placed in loose layers of 8 inches, was done by two Adams dual-drum sheepfoot rollers, each pulled by a Caterpillar Fifty tractor. These tractors were equipped with bulldozers for spreading, and were assisted by a Caterpillar No. 12 power grader which was also used as a scarifier for removing portions of the existing pavement where the detours were constructed along the shoulders.

Topping Material

Where the soil in the subgrade was considered unsuitable because of its low bearing capacity or inability to lose moisture, it was removed and wasted on the sides of the fills and replaced with sand-clay or gravel, a high-grade granular material with plenty of internal stability. The State Highway Department sought out borrow pits of such material within hauling distance of the job and spotted them on a map showing their estimated yield and the distance from the road, to assist the contractors in preparing their estimates for bidding, thereby saving them the time and expense of making their own investigations. Of all the possible locations shown on the map, only a few were actually needed. The Department also secures options from the land owners to purchase the pits and passes these on to the contractor who can usually buy the material for 2 or 3 cents a yard and remove it with his own equipment.

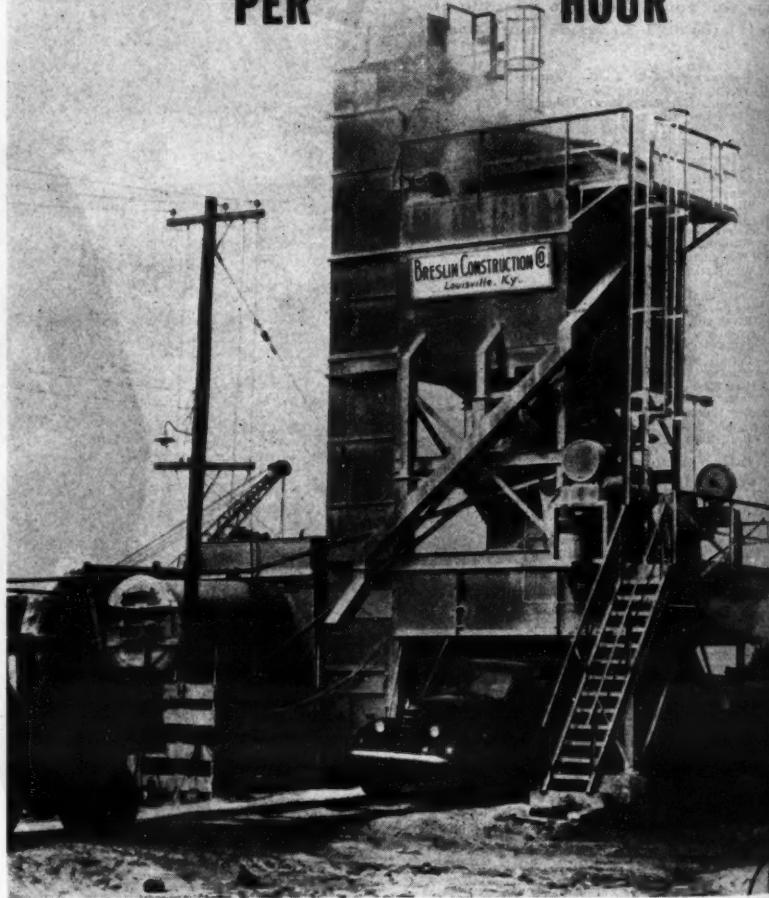
On this contract three borrow pits

strung along the road sufficed; one was directly on the right-of-way, while the other two were 400 feet north and 1.7 miles south of the road, respectively. The average length of haul from all three pits to the locations requiring topping material was a mile, which came within the limits of the base price for this contract item. For each additional half mile of haul, payment was made on a yard-half-mile overhaul unit basis. The sand-clay or gravel was excavated by a Bucyrus-Erie 20-B dragline with a 1/2-yard bucket and loaded into twelve dump trucks, two Fords and ten Chevrolets, which carried from 4 to 5 yards to selected locations where it was deposited and spread by the tractor-dozers and power grader in 6 or 8-inch layers, according to the condition of the soil which it replaced. The poorer the soil, the thicker the combined layers of topping material.

Grading Eastern Section
Of the 8.46 miles comprising the east.

(Continued on next page)

115 TONS BITUMINOUS CONCRETE PER HOUR



August 31, 1945

The F. D. Cummer & Son Company
Cleveland, Ohio

Model No. 1400 Asphalt Plant

Gentlemen:

The above model Cummer Asphalt Plant which we purchased from you and put into operation at Berea, Kentucky, on July 5, 1945, has proven satisfactory far beyond our expectations.

For your further information, on July 25, 1945, we operated this plant continuously for 11½ hours and produced 1315.8 tons of bituminous concrete. It is unfortunate that at this particular location we cannot get enough aggregate to run this plant at capacity at all times. We firmly believe that we could easily produce 120 tons per hour if the aggregates were available.

Yours very truly,

BRESLIN CONSTRUCTION COMPANY
E. P. Moynahan, General Superintendent

SPEED WINTER CONCRETE Cut Form Expense by Half . . .

with
**CALCIUM
CHLORIDE**
IN THE MIX

Use calcium chloride for the high early strength that gets concrete out of danger quicker in cold weather and thus saves half the expense of normal protective measures.

Use calcium chloride to secure adequate strength in your concrete to permit removal of forms in half the usual time so you can use them over again and make every dollar invested in forms do double duty.

Gains in strength with calcium chloride in your concrete are consistent with standard Portland, High Early or Air Entraining cements. These strength gains are obtained at a much lower cost with calcium chloride than with the use of additional cements or special cements. Association Bulletin No. 28, "Early Strength Concrete," gives the facts in detail.

Calcium Chloride Association
4145 Penobscot Building
Detroit 26, Michigan

CALCIUM CHLORIDE

SPEEDS WINTER CONCRETE CONSTRUCTION



The F. D. CUMMER & SON COMPANY
CLEVELAND

OHIO

Grading and Paving New 16-Mile Highway

(Continued from preceding page)

half of the contract built by E. J. & W. L. Cobb, Inc., a distance of 0.86 mile passes through the town of York where the pavement widens from the highway width of 22 to 43 feet. This municipal roadway section consists of two 11-foot lanes at the center, the same as the highway section, but also has two adjoining 10-foot lanes, on each side of which is a 6-inch integral curb. A 4-foot concrete sidewalk, built at a 2-foot distance from each edge of the concrete pavement, has a 4-inch thickness except at driveways where it was increased to 6 inches. The 2-foot strip between the walk and the road was covered with loam topsoil to make a grassy area.

The old pavement through York was 30 feet between curbs, and the increase in width necessitated the shifting of water mains through the town. Excavation for the 6-inch vitrified-clay pipe underdrain was done mainly by a Buckeye ditcher. The top of the drain was laid approximately 3 feet below the top of the pavement under both edges, with the lower three-quarters of the pipe surrounded by impervious material from the trench, and the upper one-quarter of the joint left open and then covered with broken stone to a point 18 inches above the top of the drain. The rest of the trench was backfilled with roadbed topping material.

Originally, Highway Department engineers hoped to by-pass York by sending the new highway around to the north of the town, but the close proximity of the Alabama, Tennessee & Northern Railroad would have compelled the construction of several grade separations if this location had been used. To the south, the line of the Alabama Great Southern Railroad was an obstacle to relocation there, so the only alternative was to adhere to the old line through the town.

On the eastern section only 1½ miles was new location, with the rest of the highway following the old road. Traffic was sent over paralleling detour roads. The existing pavement was scarified by four Caterpillar power graders: one No. 66, one No. 12, and two No. 10's. Grading was done by three 12-yard and one 9-yard LeTourneau scraper, each pulled by a Caterpillar D8 tractor, and a Bucyrus-Erie 10-yard scraper pulled by an International TD-18 tractor, which were assisted in loading by a Caterpillar pusher tractor. Two other Caterpillar RD7's with dozers and an Allis-Chalmers tractor leveled the earth work and pulled three Bros sheepfoot rollers over the fill.

Excavation, which started in October, 1944, was shut down just before Christmas and did not resume until April 1, 1945. The average haul of material was 500 feet, with the scrapers averaging about 2,000 cubic yards in a 10-hour day, with time out each day for greasing the units. With the use of old and worn equipment, which could not be replaced because of the war shortage, there were always at least two tractors laid up at a time for repairs or awaiting new parts.

For obtaining topping material, five borrow pits were opened, two on the right-of-way and the remaining three off the road 500 feet, ¼ mile, and ½ mile respectively, making the average haul to the job about ¾ mile. Material was taken from the pits by two Bucyrus-Erie shovels, a 10-B and a 22-B, and loaded into twelve Ford trucks holding an average of 5 yards.

Concreting Equipment

The batch plant for the concrete paving was set up at a railroad siding near

York, mid-point of the two adjoining contracts, and consisted of Butler bins holding 20 yards of aggregate which was loaded by a Northwest crane having a 40-foot boom and a 1½-yard clamshell bucket. The fine and coarse aggregates, sand and washed gravel, were supplied by the Aliceville Sand & Gravel Co. at Aliceville, Ala., 60 miles north of York, and shipped in railroad cars over the Alabama, Tennessee & Northern Railroad to the batch-plant siding. The contractors also had a choice of slag from the Birmingham steel mills for use as coarse aggregate. The gradations of the sand and the water-processed gravel were:

Screen Size	Per Cent Passing	
	Sand	Gravel
1½-inch	.....	100
1-inch	.....	90-100
½-inch	.....	25-60
¾-inch	100	.....
No. 4	95-100	0-10
No. 8	75-100	.....
No. 16	45-90	.....
No. 30	3-35	.....
No. 100	0-8	.....

Products of six different portland-cement companies were used in different sections of the pavement in the

form of tests to see which wears the best. The companies whose cements are being tested are Alpha, Atlas, Coosa, Lehigh, Lone Star, and Penn-Dixie, all of which supplied bulk cement. In addition to these tests, a 4½-mile stretch near the east end of the highway near Livingston was paved with a blend of 75 per cent portland and 25 per cent slag cement for experimental purposes. The Magnolia slag cement, a local product of Alabama, comes from the Southern Cement Co. and is said to impart low-heat and air-entraining characteristics to the concrete.

The fine grade for the concrete pavement was prepared by Lakewood, Ted Carr, and Buckeye subgraders, after which it was rolled by a Galion 10-ton 3-wheel roller. Paving was done by a Koehring 34-E dual-drum paver with a 35-foot boom which pulled along a scratch template. Final grade adjustments were done by hand. A mechanical screed and finisher followed the full 22-foot-width pour. Contraction

joints were cut at 40-foot spacing immediately behind the transverse finisher. These contraction joints consisted of slots ½ inch wide x 2 inches deep cut by a manually operated device which was followed by a Koehring Longitudinal Finisher. The slots were later poured with asphalt.

A longitudinal joint was cut down the center of the pavement, the same dimensions as the contraction joints, and also poured later. At alternate 40-foot spacing with the contraction joints are expansion joints of bituminous material 1 inch thick, the top of which was placed ¾ inch below the surface of the concrete. Along the expansion joints and the edges, the pavement was rounded off with a ½-inch-radius edging tool. Half-inch tie bars 2 feet 3 inches long on 2-foot 6-inch centers were used along the center-line joint. Curing was done with a spray of True-Cure, a membrane curing compound.

The concrete pavement has a parabolic crown of 1¼ inches while the 8-

(Concluded on next page)

Heil Hi-Speed Bottom Dump Wagons

...famous for big capacity, hi-speed, off-the-road hauling

You can maintain "stepped-up" schedules on dirt-moving with a Heil Hi-Speed Bottom-Dump Wagon — because you haul *faster* (up to 27 m.p.h.), and you haul *bigger loads* (17 yards).

Many time-saving features

The big capacity cuts spotting delays; the big open top speeds the loading cycle. The hydraulic power steer gives you quick maneuverability. The wide tread, low center of gravity, and high hitch point give stability, for safe operation on fast hauls.

Doubles with a scraper

The 15-yard Heil Hi-Speed Scoop is quickly and easily interchangeable with the dump wagon equipment. By using both Dump Wagon and Scraper with one power unit, you save on capital investment, increase your job capacity, and fit

your equipment to lowest cost operation — on any dirt-moving job.

Doors power-opened in 2 seconds

Dumping is under fingertip control — all in one heap, or with an even spread. With the doors wide open, operating on a clamshell principle, you get a 35-inch clearance — so that the operator can dump his load and get away in a flash. The operator can turn off the windrow at sharp angles whenever he chooses.

Do a little figuring right now, and see what this means to you in dollars and cents and a reputation for clean-looking, on-time completions. For complete details . . .

See Your Nearby Heil Distributor

THE HEIL CO.
GENERAL OFFICES MILWAUKEE 1, WISCONSIN



Heil Earth-Moving Machinery

- Trailbuilders • Bulldozers • Cable Scrapers • Sheepfoot Tamping Rollers • Hi-Speed Wheel Tractor with Semi-Trailer Scraper or Semi-Trailer Bottom-Dump Wagon.

Grading and Paving New 16-Mile Highway

(Continued from preceding page)

foot shoulders have a slope of $\frac{1}{2}$ inch to the foot, with a 1-foot strip of 4-inch sod placed along the edge of the pavement on the western section. On the eastern portion of the project a strip of sod of the same dimensions was placed along the outside edge of the shoulder to see which location will give the better results. When the sod is laid along the edge of the pavement, it is felt that protection is given to the edge of the slab during its early life, and when the sod is on the outside edge of the shoulder it protects the wide shoulder from washing into the ditch, although it might have a tendency to act as a dam and retain water on the shoulder. Side slopes are 10:1 minimum and 1 $\frac{1}{2}$:1 maximum, with a ditch at least 3 feet wide and from 1 $\frac{1}{2}$ to 3 feet deep.

Major Items

The major items on the Cobb Brothers Construction Co. contract for the western half of the highway were:

Excavation	273,000 cu. yds.
Roadbed topping material	31,600 cu. yds.
Plain-concrete pavement, 8-in. uniform	102,800 sq. yds.
Concrete for culverts	823 cu. yds.
Reinforcing steel	107,742 lbs.
Concrete pipe, 18 to 42-inch	3,265 lin. ft.
Vitrified-clay underdrain, 6-inch	6,000 lin. ft.
Vitrified-clay pipe, 18-inch	1,497 lin. ft.
Solid sodding	11,300 sq. yds.

The major items on the E. J. & W. L. Cobb, Inc., contract for the eastern half of the highway were:

Excavation	232,300 cu. yds.
Roadbed topping material	53,300 cu. yds.
Plain-concrete pavement, 8-inch	121,500 sq. yds.
Plain-concrete pavement, 6-inch for driveways	1,000 sq. yds.
Concrete sidewalk, 4-inch	3,500 sq. yds.
Integral curb, 6-inch	8,900 lin. ft.
Vitrified-clay underdrain, 6-inch	5,100 lin. ft.
Concrete pipe, 18 and 24-inch	3,669 lin. ft.

Personnel

Representing the Alabama State Highway Department on the western half of the project was W. A. Smith, and on the eastern half was E. D. Fay, as Resident Engineers. G. M. Wakefield was Superintendent for C. O. Mitchell, the grading contractor on the western section, and E. H. Lassiter was Superintendent for W. B. Brantley who built the culverts on this part of the job. Joe Culpepper was Paving Superintendent for Cobb Brothers Construction Co., and John Yates was Superintendent for E. J. & W. L. Cobb, Inc., contractor on the eastern end.

The work is located in the Third Division of the Alabama Highway Department, of which S. J. Cumming is Division Engineer. G. W. Phillips is Construction and Maintenance Engineer for the Highway Department, with J. F. Tribble, Assistant Construction Engineer.

Cummins Sales Expansion

The reorganization of its sales department, with the creation of two new divisions, has been announced by the Cummins Engine Co., Inc., Columbus, Ind., diesel-engine manufacturer. Activities will be divided into direct sales through dealers, and sales to manufacturers who power their equipment with Cummins diesels.

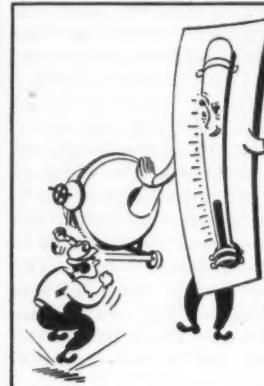
Norman E. Palmer has been named General Sales Manager, under Paris E. Letsinger, Vice President in charge of distribution. J. D. Allen is Sales Manager for dealer organizations, and Fred W. Sparks, Sales Manager of manufacturing accounts. Mr. Palmer has been Washington Representative during the war, and was previously in the firm's New York office. Mr. Allen has been Assistant Sales Manager, and Mr. Sparks was formerly Manager for the Cleveland region.

Construction on the most recent addition to Cummins' production facil-

ties is expected to be completed soon, enabling the firm to double its output of the 250-hp Model L. Today there are 126 authorized Cummins dealers in the U. S. and Canada, and export markets are also being served by the firm. About 132 equipment manufacturers use Cummins engines in their products.

New ASD Chief Engineer

The appointment of Fred J. Schmidt as Chief Engineer has been announced by the American Steel Dredge Co., Fort Wayne, Ind. For nine years with the Memphis office of the U. S. Engineers on river-dredging work, Mr. Schmidt served as Chief Marine Engineer for the Pennsylvania Shipyards, Inc., Beaumont, Texas, during the war. His new duties will include engineering work on hydraulic, dipper, and clamshell dredges, crane and cargo barges, and special hulls for various types of shallow-draft vessels, all of which are to be built in the standard bolted-steel design patented by ASD.



DON'T LET THE THERMOMETER SLOW YOU UP!

Speed Concrete in Freezing Weather with

SOLVAY CALCIUM CHLORIDE

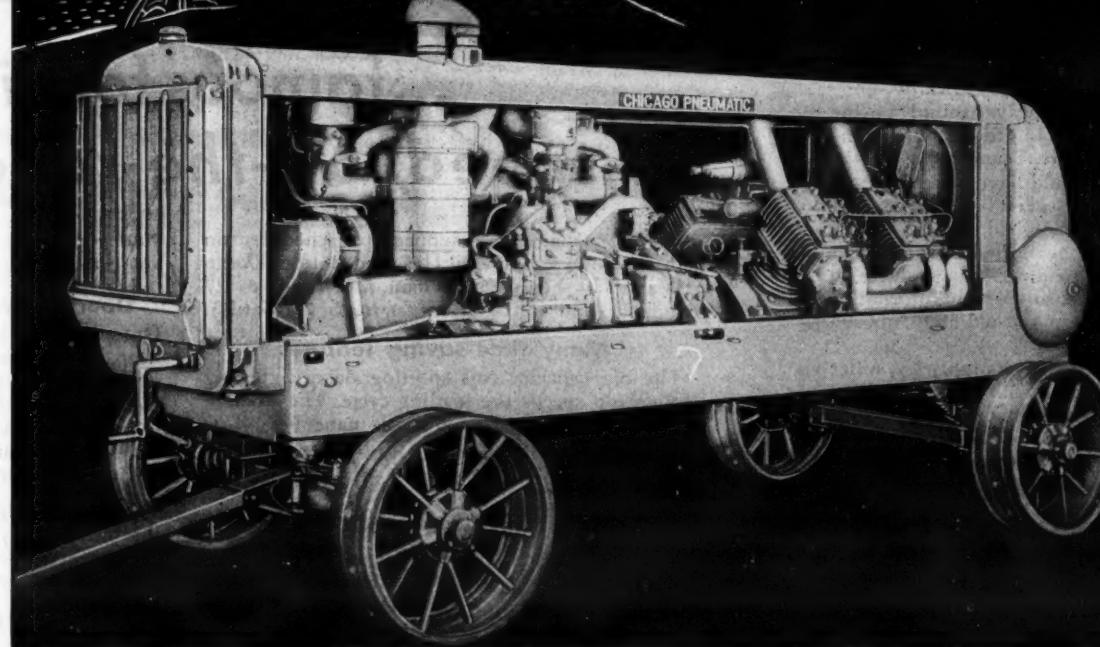
Your concreting operations need not be slowed up by low temperatures—just add SOLVAY Calcium Chloride to your mix.

SOLVAY Calcium Chloride should be added to concrete at all seasons, to increase early and final strengths, provide uniform, dependable curing. Gives added cold weather protection and shortens protection period.

SOLVAY SALES CORPORATION, 40 Rector Street, New York 6, N. Y.



500 Feet of Air on Wheels



CP 500-Ft. DIESEL-DRIVEN PORTABLE COMPRESSOR

POWERED by a Caterpillar D-13000 Diesel engine, this rugged CP 500-Ft. Portable Compressor owes its exceptional smoothness to the true V-8 arrangement of the compressor cylinders and the use of a 6-cylinder engine. In addition, it features such well-known CP design refinements as gradual speed regulation —

Simple Valves — pressure lubrication — self-adjusting clutch — spring suspension and automotive steering. Many hundreds of these efficient, low maintenance-cost compressors are in service throughout the world. CP Portable Compressors are available also in sizes of 60 to 315 c.f.m., gasoline or Diesel powered. Write for data.

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AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

Tools to Operate With Your Tractor

Both standard and unusual applications of LeTourneau tractor equipment are pictured and described in a new eight-page folder issued by R. G. LeTourneau, Inc., Peoria, Ill. The booklet features Carryall scrapers, Tiltdozers, Rooters for fragmentation, sheepfoot rollers, and cranes for heavy lifting. Photographs of actual operation on construction and other projects are prominently featured. Shown also is the LeTourneau power control unit for use on any type of tractor.

Copies of the booklet may be ob-

tained by CONTRACTORS AND ENGINEERS MONTHLY readers who mention this review when writing direct to the manufacturer.

AED Moves Office

The headquarters office of the Associated Equipment Distributors, located for the past five years in the National Press Building, Washington, D. C., has been moved to 1928 Eye St., N. W. This move was necessary to provide larger space, due to the growth and expansion of the activities of this group of distributors of road-building and construction equipment.

Bethlehem Staff Changes

David S. Gendell, Jr., General Manager of erection for the Bethlehem Steel Co., has retired after 45 years with the organization, and has been succeeded by J. H. Wagner, Manager of erection in the New York district since 1928. G. C. Lane, with Bethlehem since 1931, has been named to Mr. Wagner's post.

Over 3,000,000 tons of fabricated steel were erected under Mr. Gendell's supervision during his long association with the Shiffler Bridge Co. (later purchased by the American Bridge Co.), the McClintic-Marshall Construction Co., and Bethlehem which acquired the

latter firm in 1931. He supervised erection of steel work for the Golden Gate Bridge, for a major portion of the Pulaski Skyway in New Jersey, and the atomic-bomb center at Oak Ridge.

Nashville Branch Moves

The Nashville branch of Dempster Bros., Inc., manufacturer of Dempster-Dumpsters and distributor of earth-moving and construction machinery, has moved from the Cotton States Bldg., to Foster Ave. & Murfreesboro Road, P. O. Box 1333, Nashville 2, Tenn., near the Tennessee Industrial School.



SIMPLY by adding an inclined boom, MultiFoote Paver is ready to mix and pour concrete for paving highways and airports and for countless other concrete mixing jobs on buildings, walls, dams and other structures, as high as 28 feet above ground level. This often means a considerable saving in equipment by eliminating the need for a crane or other similar machine for hoisting the concrete into position. The inclined boom can be raised or lowered by power to any position from horizontal to an incline of approximately 35°. Drive mechanism is mounted well back of the discharge end of the paver so the boom can be angled sharply to

left or right. Bucket is suspended vertically regardless of the incline of the boom and can be dumped at any point on the boom.

Thorough mixing, high capacity, faster charging and discharging, added to the flexibility provided by the inclined boom make the MultiFoote the ideal machine for helping you obtain your full share of the huge construction program now getting under way. Get the profit-making facts on MultiFoote Pavers and the inclined boom from your nearest Foote distributor or write direct.

THE FOOTE COMPANY, Inc.
1916 State St. • Nunda, N. Y.



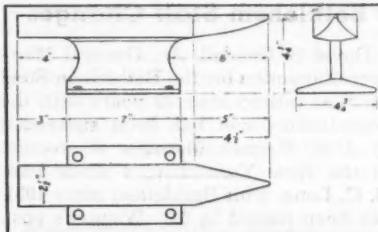
MULTIFOOTE
CONCRETE PAVERS



Small Anvil for Shop Easily Made by Hand

A serviceable small anvil can be made by hand in any highway or contractor's shop, using a cutting torch, Oxy-Acetylene Tips says in a recent issue. The necessary materials are a short piece of scrap railroad rail and a cutting blowpipe, plus a steady hand. One operator has cut a finished anvil from a 15-inch length of 90-pound rail in about 15 minutes, the magazine reports.

The anvil stands 4½ inches high, is 4½ inches in width at the base, and 7 inches long, being cut 3 inches in from the tail of the anvil, the total length of which is 15 inches. The anvil head is 2½ inches wide, and runs 10½ inches from the tail to the base of the taper which is 4½ inches long. These dimensions may be altered to suit individual requirements, or heavier rail may be used. Holes can be drilled or cut in the base with a blowpipe to permit mounting on solid support. Where the con-



These recommended proportions for a handy shop anvil may be altered to suit individual requirements.

ventional rounded horn is required, the rail can be roughed out by cutting straight in with the blowpipe for a small distance at the base of the taper, and then making tapering cuts towards the point. Excess metal is ground off to finish the horn.

Proper care of equipment was a patriotic duty during the war; it is always "good business". Regular lubrication will help to keep your machines operating profitably.



IDEAL FOR CITY WORK...

221 PARSONS TRENCHLINER

The new Parsons 221 Trenchliner, public service model in the Parsons line of trenchers, sidesteps surface obstructions as close as 10" to either side of the projected trench. Boom shifts from side to side across entire width of boom carriage. Easy to shift, because it rides smoothly on big diameter rollers. Arc type spoil conveyor reaches up 6' 9", easily dumps into 1½-ton trucks. Telescoping ladder type boom can dig over and under obstructing pipes in trench, virtually eliminating hand work.

CONDENSED SPECIFICATIONS:

DEPTH OF TRENCH:	Up to 8'-0"
DIGGING WIDTHS: Buckets:	16", 20", 24"
with Special Teeth:	22", 26", 30"
with Sidecutters:	28", 32", 36"
DIGGING SPEEDS:	25—from 2" to 118" per min.
BUCKET LINE SPEEDS:	5—31 to 232 ft. per min.
TRAVELING SPEEDS:	5—½ to 2½ miles per hr.
CONVEYOR BELT SPEEDS:	5—48 to 357 ft. per min.

NEW 221 TRENCHLINER CATALOG JUST OUT!

PARSONS COMPANY
KOEHRING SUBSIDIARY NEWTON, IOWA
TRENCHING EQUIPMENT



Large Plywood Panels For Concrete Forms

Oversize plywood sheets, applicable for use in concrete forms, are to be stock material handled by panel distributors in the same manner as standard-size plywood, the Washington Veneer Co., Olympia, Wash., reports. Civilian stock is now being supplied by the firm, with shipments comprising panels 14 to 32 feet long, 4 feet wide, and ¼ to ¾ inch thick. One panel made by the firm is over 50 feet in length, 5 feet wide, and ¾ inch thick. It has a 2,500-square-foot area, and weighs about 550 pounds.

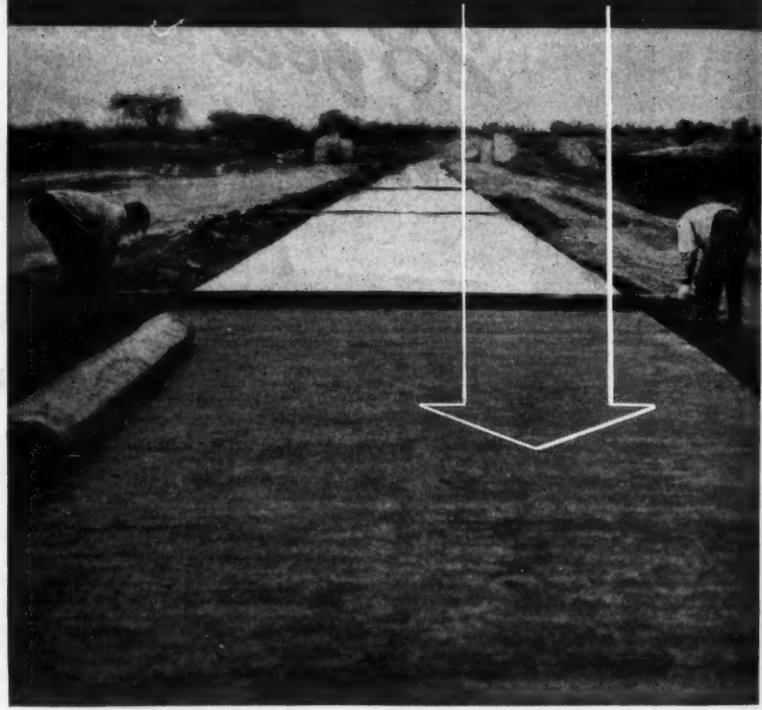
The large sheets are made by joining

together several standard-size panels, following a simple, precise, three-step procedure. The standard panels are end-beveled in a smooth, gradual cut; the tapered ends are then bonded with waterproof adhesives to form the large sheet; and the panels are sanded smooth. The latter operation may be dispensed with if finished panels are not desired.

New Macwhyte Director

R. P. Tyler, General Sales Manager of the Macwhyte Co., Kenosha, Wis., has been elected to the Board of Directors of the firm, which makes wire rope, slings, and related products.

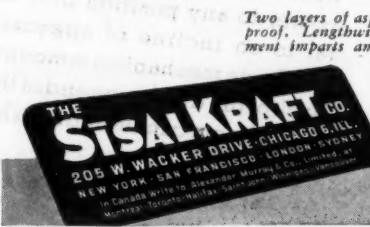
AFTER the 10th USE SISALKRAFT CURING Blankets RETAINED 98% MOISTURE



USE of Sisalkraft blankets over and over again does not appreciably reduce their curing efficiency! Actual field tests prove that even after their 10th use 98% of the moisture of the original mix is held in the slab. Complete intact coverage is assured — no area is skimped — SUPERVISION IS REDUCED TO A MINIMUM.

Moreover, field research has developed newer and quicker methods of applying Sisalkraft blankets — reduced square yard cost to a point heretofore unequalled!

Sisalkraft is FIELD TESTED — TIME TESTED. Approved by over 40 State Highway Departments — regarded by road contractors as the most efficient and low cost concrete curing agent. Write for detailed information.



Two layers of asphalt make SISALKRAFT waterproof. Lengthwise and crosswise fibre reinforcement imparts amazing strength with flexibility! Two layers of high wet strength kraft paper seal in the asphalt, preventing it from drying out. SISALKRAFT is a processed product — the result of scientific research.

Manufacturers of SISALKRAFT, FIBREEN, SISAL-L, SISALTAPE and COPPER-ARMORED SISALKRAFT.



The discharged veteran wears this emblem. Remember his service and honor him.

Traffic Maintained During Bridge Repair

Unique Methods Used by Contractor on Long Wood Spans; State Force Also Repairs Other Bridges

(Photo on page 1)

WHILE there is only one Altamaha River flowing through southeastern Georgia on its way to the Atlantic Ocean, the numerous overflow branches paralleling its course through the coastal plain require many long bridges to carry the state highway system. On Ga. 38, for instance, which the Altamaha crosses about 40 miles above its mouth, there are nine timber bridges totaling a mile in length strung out over a 5-mile stretch of road southwest of Ludowici. The longest is a 1,500-foot bridge which has a steel-truss swing span in the middle of its timber trestle bents to permit navigation on the main river channel.

This year these bridges were extensively repaired and strengthened, the three longest being done by contract while the remaining six smaller spans were overhauled by State Highway Department of Georgia maintenance forces. Difficulties encountered in this work were shortage of timber and lumber, maintaining traffic during the bridge repairs since there were no alternate detour routes, and a shortage of labor. Not only were rotten, weak, and worn-out timber members replaced in this reconstruction, but new stringers were added to increase the capacity of the bridges from 10 to 15-ton loading.

All bridges are alike, consisting of four-pile bent construction with 18-foot spans. The piles are 10-inch diameter at the tip, 14-inch at the butt, and are spaced 6 feet on centers across the bent. On top of the piles is a 10-inch-deep x 12-inch-wide x 21-foot-long cap which supports eleven 4 x 15-inch stringers on which rests the deck made of 4 x 8's. Four additional 5 x 12-inch stringers were added to each span, and shim blocks placed under the other stringers to make their tops level. The 4 x 6 hub guards on each side of the 18-foot roadway were replaced with 6 x 8's.

Contract Repairs

Two bridges numbered 5 and 6, counting from the Altamaha in the direction of Ludowici, were reconstructed by J. F. Thomson, a St. Petersburg, Fla., contractor. Known as the Back Swamp Bridges, they are each 689 feet long and required a total of 3,500 linear feet of new piling, the replacement of from 50 to 60 per cent of the caps, an average of one stringer replaced in each span plus the four new stringers, and

new lumber throughout for all construction above the stringers. This included the deck flooring, hub guards, and a 3-foot hand-rail to replace the old 4-foot rail.

While Georgia highway engineers would have liked also to widen the bridges at this time, the presence of concrete firebreaks at 200-foot intervals across the spans would have greatly increased the cost of an additional strip on each side. The firebreaks cover two spans or 36 feet, and consist of a 6-inch concrete slab which would resist the spread of a fire across the entire bridge should the wooden deck be ignited at any point.

Where a pile had to be replaced in a bent that was on land and not in the water, a hole was dug by hand around

the old pile and it was cut off as close to the ground as possible with a cross-cut saw. Over the pile stump was placed a mud sill of assorted-size timbers on which was erected a new pile of the exact length to fit under the pile cap. This "framing in" of new piles could not be done if the bents were in the water, where they had to be driven.

Unique Approach to Work

If the bridge could have been closed to traffic, the job of renewing piles, caps, stringers, and deck would have produced no great problem in construction, but carrying on operations and maintaining traffic at the same time required unique methods and ingenuity on the part of the contractor. His principal equipment included a Universal crane with a 32-foot boom mounted on a Mack truck with hard rubber tires, and two needle beams, 36 feet long, each consisting of a wooden A-frame with a steel girder as the lower chord member, which had been formerly used in an old bridge truss. The truck crane,

which the contractor rented from the State, had been purchased from the Government by the State at the end of World War I and is still in good working condition.

The two needle beams were placed on the deck at each side of the bridge so that their ends were directly over the two caps on either side of the bent on which work was to be done. A 3-foot-wide opening was made in the bridge deck over the cap and the planking was replaced with short sections on one side so that traffic could pass over that half of the bridge width. The center cap was then loosened from the piles by prying with a bar, and the drift-pin connections were cut with a hack saw by two men suspended below the deck in bosun's chairs.

A wooden construction cap, the same dimensions as those in the bridge, was then slung under the deck by means of the boom on the crane. This temporary cap was placed alongside the regular cap, and then fastened at each end to

(Continued on next page)

USE RIGHT BUCKET FOR THE JOB

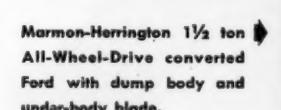


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All-Wheel-Drive TRUCKS

Bridge Repair

(Continued from preceding page)

the needle beam by means of a $\frac{1}{2}$ -inch cable and heavy chain. The stringers were spliced if necessary so they would rest on this cap. One end of each beam was next jacked up from the floor of the bridge by a Simplex No. 10 railroad jack that has a lift of 14 inches, and shored up with wooden blocks just high enough to take the load of the bridge superstructure off the middle cap. It was necessary to jack the beams at one end only and the other ends were left on the deck. The entire weight of the two 18-foot spans was thus transferred through the needle beams to the bents on each side of the construction cap being removed.

New Piles and Caps

The old pile-bent cap was then removed by the crane so that piles could

be driven where they were needed. The old piles were not removed but the new piles were driven flush against them, in line, of course, with the other piles in the bent. The new piles are the same size as the existing ones and average from 40 to 45 feet long. In driving the piles, the crane used a 1,600-pound gravity hammer moving in 30-foot swinging leads with a drop of 10 to 15 feet. The piles were driven to a 15-ton bearing with a 15 to 20-foot penetration. The height of the bridge is about 15 feet over the water which varies in depth from 6 to 15 feet.

When the new piles in one bent were all in place, the crane working along one side of the deck swung either a new cap, or the old one if it was still in good shape, over the side for the workers below to manipulate into position on top of the piles. Holes were bored through the cap with a brace and bit, and new drift pins driven into the piles by a sledge hammer which was swung against a $1\frac{1}{2}$ -inch iron bar held on top of the pins. The ends of the needle

beams that had been jacked up on blocks were lowered to the deck, transferring the load back to the regular cap and bent. The temporary construction cap was then again fastened to the crane boom with a cable, slid out from under the bridge, and hoisted to the deck.

When all cap and pile work was finished, the deck was torn up, half the roadway width at a time, the new stringers added, and the old ones shimmed up or replaced as needed. Then the entire new deck, hub guards, and railing were added.

The new timber used in this bridge contract was hard cypress, with from 75 to 80 per cent being from the heart of the wood. State specifications require that this wood be taken from pond rather than river cypress trees because of the extra strength and hardness found in the former variety.

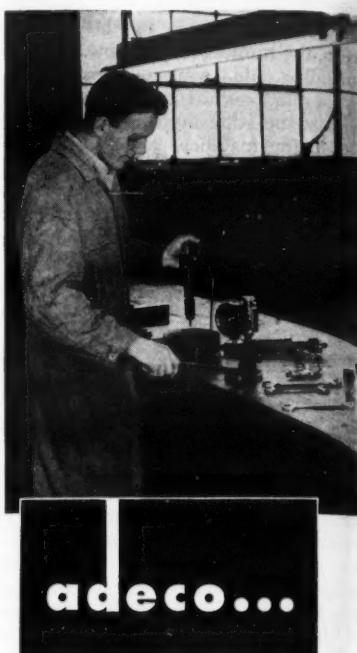
Cost and Personnel

As the exact amount of work on these two bridges could not be determined

until an inspection was made of the timber members after the removal of some of the superstructure, the contract for this project was let by the State Highway Department of Georgia on the basis of unit bids, a price per linear foot of piling and another per 1,000 board-feet of lumber. An approximate estimate of the total work required was furnished to the contractors as a guide in bidding. Payment was made each month for the amount of work done at the unit bid prices.

Work was started on the reconstruc-

(Concluded on next page)



a deco...

NOZZLE TESTER Keeps Diesel Engines Running Efficiently

To keep diesel engines operating at peak efficiency, this portable, precision-built Adeco Nozzle Tester is indispensable.

Light in weight yet built for heavy-duty service, it enables any mechanic to make quick accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Tests both large and small injectors, on bench or engine, at pressures up to 10,000 p. s. i. Prevents costly delays and possible damage to engine.

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to 10,000 p.s.i.



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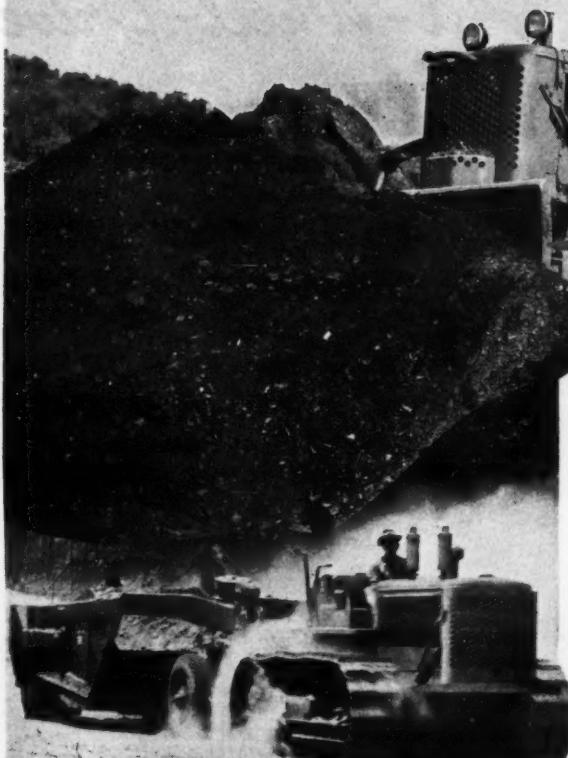
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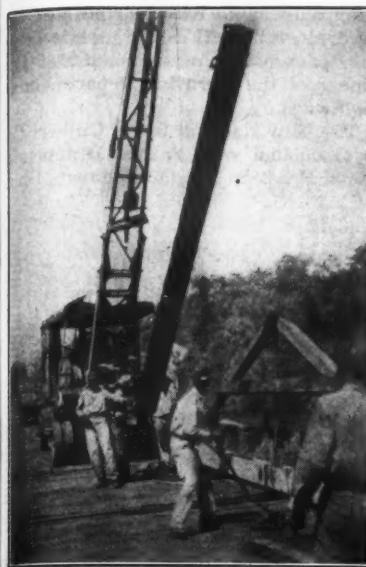
We'll see you at the
A.R.B.A. Convention
Chicago, January 14-17



INTERNATIONAL



Industrial Power



C. & E. M. Photo
A Universal crane lifts the temporary construction cap to the deck of a wood bridge under repair.

Bridge Repair

(Continued from preceding page)

tion of these two bridges on May 1, but because of the traffic problem it was not completed until September, at a total cost of around \$37,000. J. F. Thomson, the contractor, personally supervised the work along with his Superintendent, G. W. Best, Jr., who was formerly Assistant Division Engineer of the State Highway Department at Savannah. The bridge crew consisted of eight men.

Last winter the Scott Construction Co. of Thomasville, Ga., reconstructed the timber trestles and draw span on the main river bridge over the Altamaha, and also built a wooden revetment on the upstream side of each of the nine bridges in order to direct the current to the proper channel and prevent bank erosion.

State-Force Operations

A crew of from six to eight men from the maintenance division of the Georgia Highway Department made similar repairs to the remaining six smaller bridges on State Route 38. No piles were driven, however, as the bridge force was not equipped with a driving rig, but many piles were set in place by framing them on mud sills.

Experiencing great difficulty in obtaining lumber, the State acquired a sawmill which the Civilian Conservation Corps had been operating in the mountains of northwestern Georgia, and moved it to a state forest preserve not far from the bridges. Last year the mill produced 500,000 board-feet of lumber which was used both for bridge and other maintenance work. The wood was black or sap pine, a low grade of lumber which would last but 18 months at most if used in an untreated state. This wood was treated by the Highway Department with Pinola, made from a rosin base, which lengthens the life of the wood to four or five years.

LANSING
WHEELBARROWS
CONCRETE MIXERS
DRAG SCRAPERS

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SINCE 1861

Wood-Treating Plant

A wood-treating plant was set up alongside State Route 38, just west of Ludowici, consisting of a concrete pit 28 feet long x 5 feet deep x 4 feet 8½ inches wide. The railroad-gage width accommodated a track which was laid on top of the sides of the pit over which was built a wooden framework supporting a block-and-fall tackle. The timbers to be treated were placed on a 10-foot-long railroad hand car which was pushed along on the rails to the center of the pit. The timbers were then hoisted clear of the car, which was moved away, and were lowered into the pit in which about 400 gallons of the treating material had been previously poured.

If the lumber was fairly dry it remained in the vat only from 10 to 12 hours, but if the wood was green it was treated for 24 hours. About 35 gallons are needed to treat 1,000 board-feet of lumber. After the treatment, the lumber was hoisted from the vat, allowed to drain for a few minutes, and then

placed on the car again which moved it down to the end of the yard where it was stored on a wooden platform. From here trucks hauled the timbers to the bridge site.

In this treating process the wood is completely permeated with Pinola which prevents water from entering. About 1,000 gallons were used at the plant every two weeks, the preservative being purchased in 55-gallon drums and shipped by truck from Savannah 60 miles to the treating pit.

Personnel

R. E. Carswell is Resident Engineer for the State Highway Department of Georgia in charge of this bridge reconstruction, both of the work done by contract and by the state maintenance forces. Besides the bridge operations, which took place in Long County, this residency also includes Wayne and Tattnall Counties. This is a part of Division 5, with headquarters at Savannah, of which D. C. Hankins is Division Engineer and A. H. Long, Assistant Di-

vision Engineer. G. T. McDonald is State Highway Engineer at Atlanta.

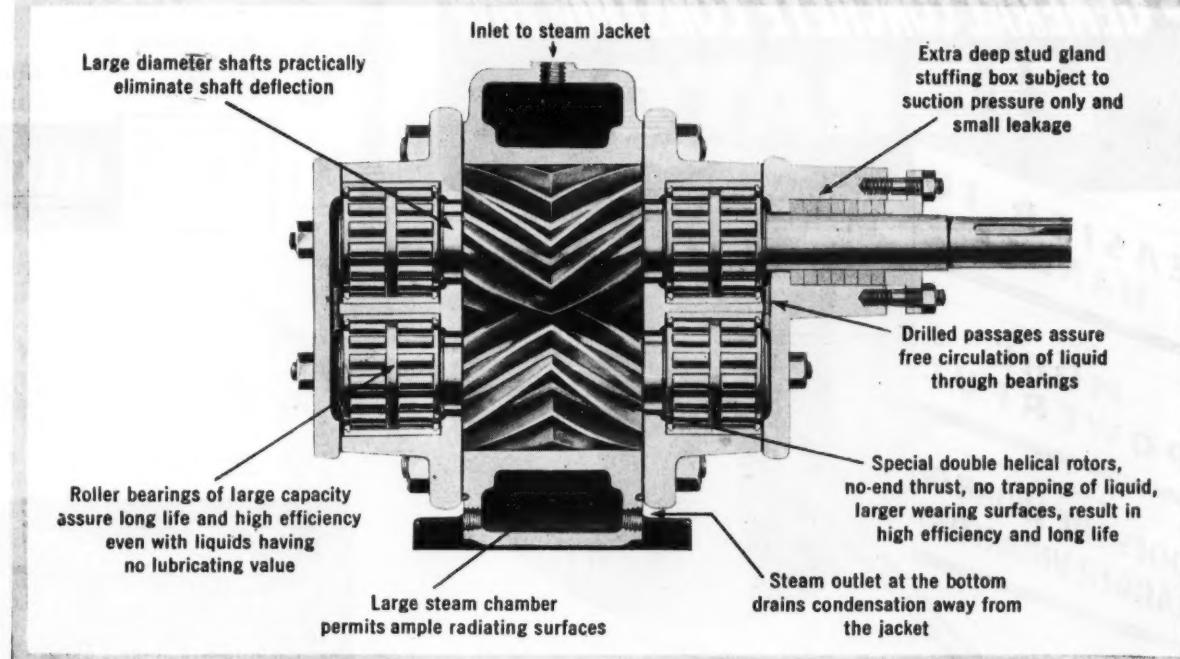
Kinner Motors Changes

Name; Expands Activities

Kinner Motors, Inc., Glendale, Calif., has changed its name to the Gladden Products Corp., following a stockholders' meeting recently. The firm has acquired, as its fourth activity, the Kinney Iron Works, Vernon, Calif. It also produces hydraulic control mechanisms, aircraft and small industrial engines.

John N. Gladden remains as President of the corporation, with G. Brashears as Vice President, and Murray Wilson, Secretary-Treasurer. The revision of name engendered no change in the firm's directorate. J. E. L'Anson heads the Kinney Iron Works as Vice President and General Manager. Wendell and Roland Kinney are being retained by Gladden for technical counsel for one year. The Iron Works will serve as a source of metal castings for firms other than the parent company.

HOW TO HANDLE ASPHALT WITHOUT GETTING "STUCK"



Specify Worthington GRJ Steam-Jacketed Rotary Pumps

Trouble-free handling is what you want in the pump you depend on for putting asphalt where you want it when you want it.

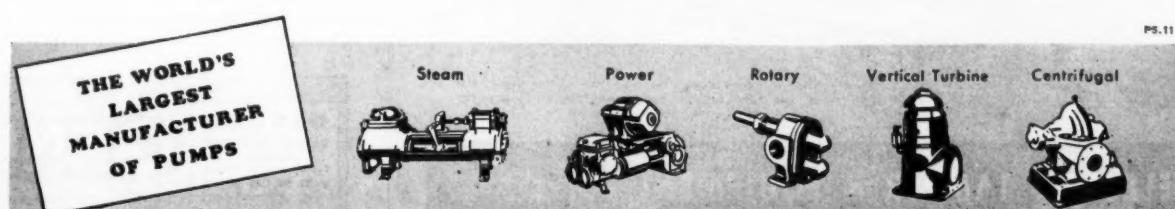
Fortunately, you can get dependability in a Worthington GRJ Steam-Jacketed Rotary Pump. The cross-sectional picture above shows you why. One thing the picture doesn't show, however, is the short starting time which results from the large radiating surfaces of the Worthington heating jacket. That means less time lost by equipment and men waiting for asphalt to flow.

Your nearby Worthington Representative can give you other valuable facts about Worthington GRJ Rotary Pumps. In the meanwhile, you can prove that there's more worth in Worthington by writing for Bulletin W487-B11.

Worthington Pump and Machinery Corporation, Harrison, New Jersey.



WORTHINGTON



New Electric Welder For Small-Shop Use

A low-priced welder said to be ideal for rural power lines has been developed by the Lincoln Electric Co., Cleveland 1, Ohio. The machine inaugurates a new development known as the "arc booster" which provides quick arc starting. When the electrode touches the work, the welding current is given a boost of intensity for starting the arc.

The current automatically reverts to the job requirement following this boost. There are no high-voltage or special frequency devices, the voltage output being limited to a 52-volt maximum. The Fleet-Arc Jr. is built for 230-volt single-phase power lines. It has a maximum input current of 35 amperes, and meets the NEMA standard for its class. Used with the standard 3-kva power transformer, the welder ranges in current from 20 amperes at 20 volts to 180 amperes at 25 volts, thus providing sufficient capacity for all types of jobs generally found in equipment maintenance shops. It will handle electrodes of 1/16-inch to 5/32-inch diameter.

A switch selects the degree of arc boosting wanted. Current control is of the separate adjustable reactance type which is varied by turning a hand wheel. Continuous adjustment over the entire welding range is provided. The welder weighs 360 pounds. It has wear-free vibrationless reactor-current control with self-cleaning chain; no taps or plugs; heavy copper winding with spun-glass insulation and mica coil separators; and arc welded steel frame and housing.

Joins Metal Culvert Firm

Alfred J. Runnals, former Road Engineer for the Vermont Department of Highways, has joined the New England Metal Culvert Co., 10 Alger St., Boston, Mass., as Consulting Engineer. With the Vermont Department since 1920, Mr. Runnals has supervised highway location and design, the preparation of plans

and contracts, and general coordination of construction work since 1925.

Hubert E. Sargent, Jr., a former Major and Squadron Commander in the Eighth Air Force, recently released from Army Service, has also joined the New England Metal Culvert Co. organization, as its representative in New

Hampshire, with headquarters at Concord. His father, H. E. Sargent, is Commissioner of Highways and Chief Engineer of the Vermont Department of Highways.

The New England Metal Culvert Co. is associated with Armco Drainage & Metal Products Inc., Middletown, Ohio.

THE NEW JACKSON GENERAL CONCRETE CONSTRUCTION VIBRATOR

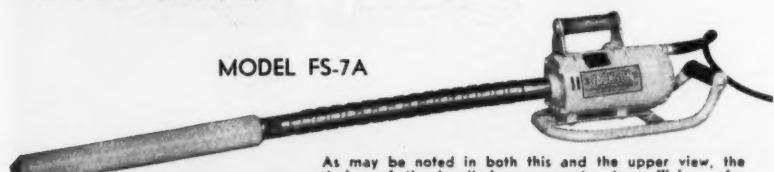
EASIER TO
HANDLE
MORE
POWERFUL
DOES THE WORK OF
LARGER VIBRATORS



A JACKSON FS-7A Flexible Shaft Vibrator placing concrete in the manufacture of precast piling.

Here's unprecedented power in a lightweight, easy to handle electric vibrator, capable of operating vibrator heads as large as 2 3/8" x 18 5/8" with flexible shafts up to 21' in length. Universal motor operates on 115 volt A.C. or D.C. and will deliver from 7000 to 10000 V.P.M. depending on the consistency of the concrete and the length of shaft used. It will take any of our standard flexible shaft vibrator heads: 2 3/8" x 18 5/8"; 1 1/8" x 16 7/8"; 1 1/8" x 10 3/4", and may be had with shaft lengths of 24", 36", 7', 14', and 21'. It is, therefore, not only ideal for the thinner and smaller sections, but for the work previously done only by much larger vibrators, as well. It's truly a "general construction vibrator" — one that equips you to handle a great variety of jobs to best advantage — with only the price of one machine invested. Write for complete details.

MODEL FS-7A



As may be noted in both this and the upper view, the design of the handle-base promotes top efficiency for both handling and skidding.

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Makeshift mousing gives place to automatic mousing. Snagging can't occur because no protruding point "asks" for it. Hook straightening and load slippage are avoided because the patented shoulders and lip LOCK the load in perfect alignment.

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AND ALL THIS. Fast highway travel (more than 20 mph) with absolute safety, air booster steering, optional four-wheel drive, heavy duty clutches and transmission, 4 speeds forward, 4 speeds reverse, easy, quick changeover of attachments . . . mobility and ease of operation that get the most difficult jobs done in record time! Conforms to all highway regulations and in most states needs no permit to travel over the roads.

ALL-IN-ONE. The General Type 10, Model 105 is a combination unit that will turn in profits on any job. Shovel, crane, backhoe, dragline, magnet or pile driver . . . you name the job, then watch this amazing machine do the work faster, better and cheaper!

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The complete story of this profit-making, versatile rig is of vital interest to every man interested in construction, excavating or materials handling. Ask your nearest distributor for your free copy of the General Type 10, Model 105 specifications, or write THE GENERAL EXCAVATOR CO., MARION, OHIO.

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SHOVELS, BRACELINES
AND CRANES

Rough Road Covered With Cold Plant-Mix

Inequalities in Surface Corrected by Spreading by Long-Base Grader; Rolled By Rubber-Tire Unit

BECAUSE of the long irregular dips in the old pavement on State Route 38 north of Birmingham, the Alabama State Highway Department had a layer of cold bituminous plant-mix spread over 5 miles of this road with a power grader, instead of using a mechanical paver or finishing machine as is the more common practice. Department engineers stipulated the use of a grader on this contract because they felt that a blade filled small depressions which might be bridged by a mechanical grader. For this reason also a rubber-tire roller was chiefly used to compact the material instead of the usual steel-wheel roller.

The section of road recently improved was originally an 18-foot concrete base, mixed with natural cement, laid in 1921-1922 to a 6-inch thickness, and its surface roughened to make a bond with a 2-inch bitulithic pavement laid as a wearing course. Tarrant City, through which Ala. 38 passes, subsequently widened the section of the road through the town 4 to 12 feet with concrete strips, but the width of the present improvement is 18 feet throughout.

A contract to put a surface on this particularly rough and pitted 5-mile stretch was awarded to the Southern Amiesite Asphalt Co. of Birmingham, Ala., on its low bid of \$16,368. The improvement began at the Birmingham city line and extended to a point 3 miles north of Tarrant City where state maintenance ends and county maintenance begins.

Tar Seal Applied

The road was first given a seal coat by a pressure distributor applying RT-11 tar for the full 18-foot width at the rate of 0.25 gallon to the square yard. The tar was immediately covered with slag screenings, graded from $\frac{3}{4}$ -inch down to No. 4 sieve size, at the rate of 0.25 cubic foot to the square yard, and was rolled first by a 5-ton steel-wheel and then by a pneumatic-

tire roller. Traffic was stopped while the tar was being covered with the slag, but the interruptions lasted only about ten minutes since stretches only 500 to 800 feet were done at a time.

For two weeks traffic rolled over the road, compacting the seal, before a tack coat was applied to the surface. This consisted of 0.05 gallon of MC-1 cut-back asphalt per square yard, which was sprayed like a fog from the 18-foot spray bar of the distributor. In order to give the road a more uniform coating, the distributor ran over the road twice, applying 0.025 gallon to the square yard on each trip.

Plant-Mix

The road was then ready to receive the plant-mix composed of asphalt and

slag in the following average proportions by weight:

Slag Sizes	Per Cent Passing
No. 4	100
No. 10	70
No. 20	46
No. 40	29
No. 80	18
No. 200	7
	3

Mixed with each ton of slag was 143 pounds of AC-8 asphalt which has a penetration of from 85 to 100. This asphalt content varied according to the screen composition of the slag aggregate; the more dust in the aggregate, the more asphalt was required.

Twelve trucks, each holding 4 tons, were used to haul the material from the mixing plant in Birmingham 5 miles to the upper end of the job where it was dumped on one side of the pavement through the tail-gates of the trucks as they moved slowly along. Each truck unloaded its contents in 50 feet. A Caterpillar No. 12 grader made a windrow of the plant-mix $1\frac{1}{2}$ feet in from the edge of the road, varying the

size of the windrow according to the amount of material required to fill in low places on the surface.

The power grader then spread the material across the road to within $1\frac{1}{2}$ feet of the other edge of the pavement, to make sure that no plant-mix was wasted or mixed with dirt by spilling over on the shoulders during the initial passes. When delivered by the trucks, the mix had an average temperature of 125 degrees F but this cooled to air temperature during the blading. The plant-mix was moved across the road six times by the grader until a smooth surface was achieved. Each time, of course, the amount of loose material moved was less, as it was compacted by the grader wheels and roller, and with each pass the plant-mix was gradually bladed out until the entire 18 feet was covered to the shoulder line.

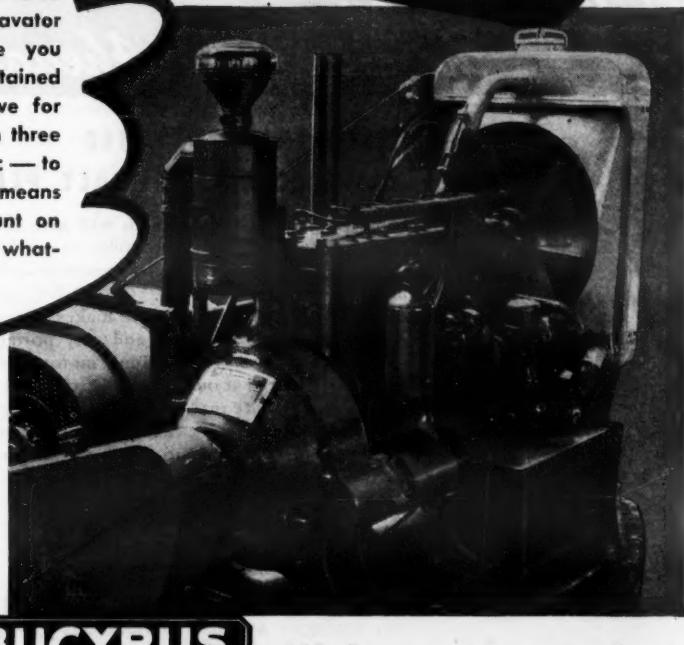
The plant-mix was put down in one layer varying in depth with the irregularities and waves in the old pavement, but the average thickness of loose ma-

(Concluded on next page, Col. 2)

THE POWER YOU NEED FOR THE OUTPUT YOU WANT



Tailored power in the right amount—that's another reason why $\frac{1}{2}$ -, $\frac{1}{2}$ -, and $\frac{3}{4}$ -yard Bucyrus-Eries have set such outstanding output records on the fighting fronts and at home. Power units on Bucyrus-Eries are carefully adapted to fit the rapid load fluctuations of excavator service. They're selected to give you plenty of power for normal sustained operation plus an adequate reserve for emergency use; they're available in three types—gasoline, diesel, or electric—to meet your requirements. That means you're getting power you can count on for speedy, efficient handling of whatever your work involves.



Besides ample, tailored power there are many other reasons why Bucyrus-Eries show the way in output. The full Bucyrus-Erie performance story will convince you.

LA CROSSE
Heavy Duty
Machinery Trailers

MADE
IN
CAPACITIES
3 TO 200 TONS
FOR
ANY
PURPOSE

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So. Milwaukee

**BUCYRUS
ERIE**

Wisconsin



In Barber County, Kansas, a Caterpillar diesel No. 12 motor grader, shown here cutting drainage ditches on a gravel road, is used for construction, maintenance, and snow removal.

New Bearing Grease

An improved grease for ball and roller-bearing motors has been announced by the Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa. It has a lubrication range of 13 to 176 degrees F for all speeds up to 3,600 rpm and for horizontal or vertical operation. According to the manufacturer, the grease is stable, highly resistant to oxidation, and will remain in a bearing for an indefinite period without drying out, caking, or separating.

The grease is available in a new tube of the nasal type. The spout, which has a large opening, fits into a $\frac{1}{8}$ -inch pipe coupling. Pressure is exerted from the end of the tube by a winding key.

Further information on the grease may be secured from Westinghouse on mention of this item.

Rough Road Covered With Cold Plant-Mix

(Continued from preceding page)

material was $1\frac{1}{4}$ inches which compacted under rolling to about $\frac{3}{4}$ inch. The average weight of the material was 80 pounds to the square yard.

Following directly behind the grader came a pneumatic-tire roller, with four wheels in front and five in the rear, pulled by a Chevrolet truck. The mix was rolled after every pass of the grader blade, getting compaction from the bottom up. Traffic was permitted during these operations as cars rolling over the mix aided in the compaction. A final rolling was given by a 7-ton tandem steel-wheel roller. By using a grader blade for spreading the plant-mix, the surface was given a coarse non-skid texture which can withstand a lot of traffic before becoming smooth.

Personnel

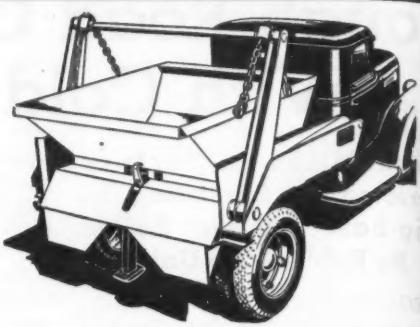
The job totaled 52,800 square yards of plant-mix surface and is located in the Second Division of the Alabama State Highway Department where R. D. Jordan is Division Engineer. Work was started on the project on April 15, 1945, and was completed on May 10. Randolph Rowe was Resident Engineer, and H. C. Lane was Superintendent for the Southern Amiesite Asphalt Co., of Birmingham. G. W. Phillips is Construction and Maintenance Engineer of the Highway Department, J. F. Tribble is Bituminous Engineer, and F. W. Weldy is Assistant Maintenance Engineer.

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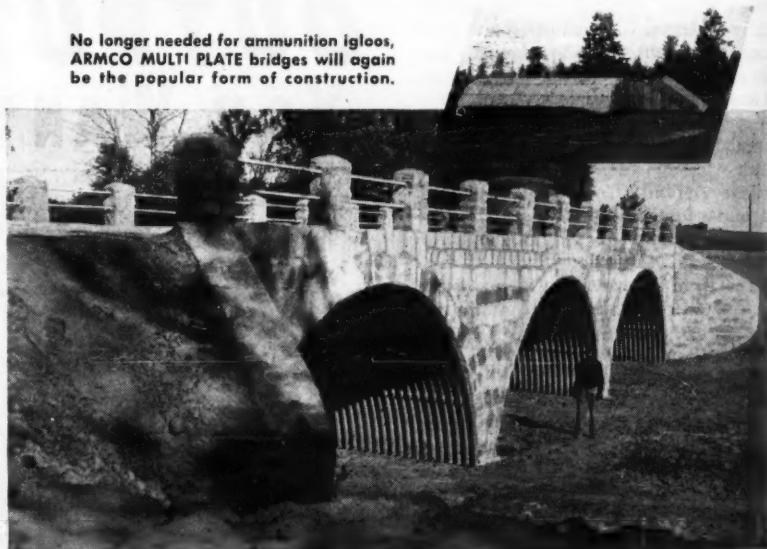
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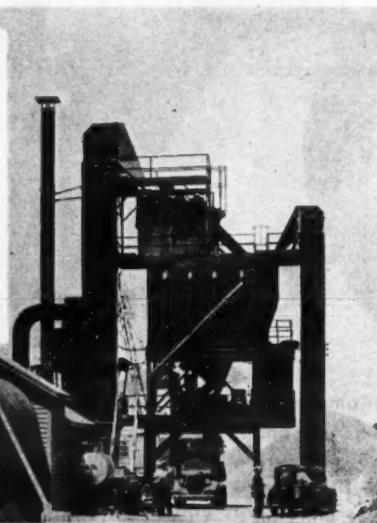


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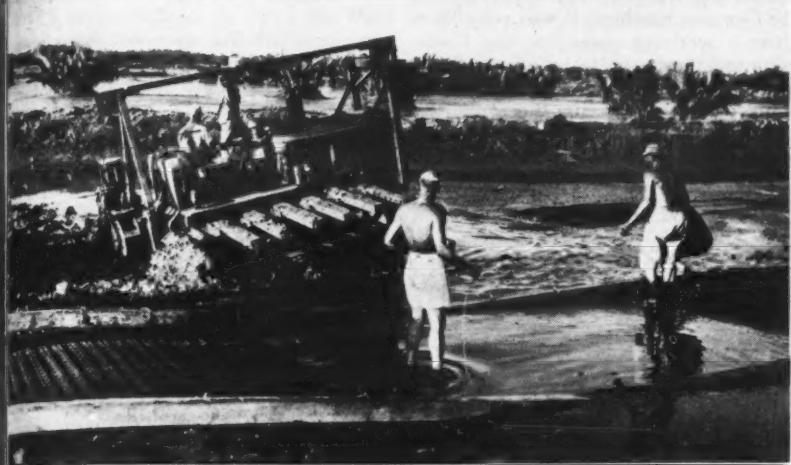
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U. S. Army Signal Corps Photos

Army engineers found a wide track for tractors a boon in handling heavy loads in soft going. It has equal application on construction jobs in wet and marshy terrain.

Wide-Track Tractor Used in Soft Going

A wide track for tractors, developed by U. S. Army Engineers for handling heavy artillery in the Pacific area, is expected to prove of great value to contractors and others working in marshy regions. Designed specifically for use in Japanese rice paddies, the device enables a tractor to take a 105-mm howitzer over terrain which no other vehicle can cross.

The equipment consists of wooden side extensions connected to the track plates. The extensions can be made right in the field. Tests of various materials showed wood to be best for the purpose. Early extensions were 4 inches thick, 6 inches wide, and 60 inches long, giving the tractor an overall width of 176 inches. These dimensions were later varied to obtain the best distribution of weight.

Experiments now in progress indicate that a continuous tractor track 32 inches wide would give the same amount of ground contact as the standard 22-inch tread fitted with the 60-inch wood extensions, as the latter are spaced some inches apart. The wider track is expected to give the tractor greater balance, enabling it to tow larger loads with less strain.

Bridge Back-Walls Of Treated Timber

The use of random lengths of pressure-treated 2 x 4 or 3 x 4-inch lumber offers a number of advantages in the construction of abutments and wing walls for bridges on county and secondary-road systems, according to a recent issue of *Wood Preserving News*. Among the advantages cited are ease of construction and freedom from gaps or shrinkage cracks through which friable material might escape. A rigidly interlocked joint between the wings and the abutment can readily be made by vertically spiking the overlapped ends of alternate strips, in the same manner that laminated storage bins are made.

It is customary to cut the outer ends of laminated wing walls to match the slope of the earth fill of the bridge approaches. If desired, such cuts can usually be made in the field with little damage to the pressure treatment, as cross sections as small as 2 x 4 or 3 x 4 are often completely penetrated by the preservative during the treating process, the article states. Most engineers, however, like to take the precaution of requiring that these field cuts be swabbed with hot creosote or coal-tar pitch.

In starting such construction, some prefer to bolt, drift, or lag a 4 x 4, a flat 4 x 6, or any other suitable timber to the piles along the bottom of the bulkhead. Using this as a base, the laminated strips are then placed and nailed together and toe-nailed to the piles as necessary.

The assembly, nailing of these laminated abutment and wing walls is generally done with 20-penny spikes at 15

to 18-inch centers in strips of 2-inch thickness and with 60-penny spikes in those of 3-inch thickness. The use of dressed timber is preferable from the standpoint of uniformity of rows and

the appearance of the finished structure.

The completeness with which small strips can be permeated by pressure preservative processes should insure a long service life for this type of bulk-

head. Similar walls in box culverts under railroad grades are still in excellent condition after more than 40 years of service, it is reported.

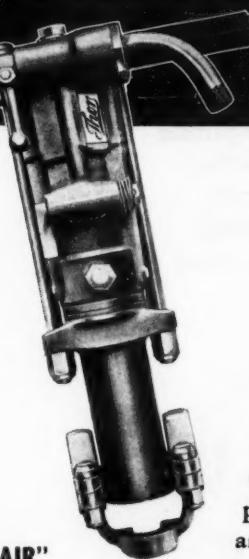
Caterpillar Assignments

Various changes in its organization have been announced by the Caterpillar Tractor Co., Peoria, Ill. J. L. Geddes has been promoted from Credit Manager of the eastern division to the governmental sales division, being succeeded by Robert C. Haungs, recently discharged from his Captaincy in the Twelfth Air Force. Mr. Geddes is in charge of the Washington, D. C., office. L. C. Lange, now Assistant Export Credit Manager, has been succeeded as Credit Manager for the central division by W. T. Gabbett, erstwhile supervisor of accounts payable. J. N. Cunningham has been advanced to the sales training department from the post of treasury department cashier. P. E. Young, another returned veteran, is now Assistant Office Service Manager.

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OTHER THOR TOOLS FOR MINING AND CONSTRUCTION



Driving and Lining Two 11-Foot Tunnels

(Continued from page 2)

1-inch hose connection placed between it and the tank, if it was desired to haul water and discharge it for purposes other than road sprinkling.

The site for the central storage house for explosives was excavated by a bulldozer in a ravine located between the two tunnels and at a safe distance from both. After construction of the heavy timber house inside the excavation, the same bulldozer replaced the dirt over and around it to a depth of 4 feet.

Drilling and Blasting

The drilling was done by Ingersoll-Rand and Gardner-Denver drifters, two operated from both upper and lower levels of each of the two jumbos, four Ingersoll-Rands on one jumbo and four Gardner-Denvers on the other. The average depth of a round was 10 feet, though some rounds as deep as 14 feet were drilled and shot. Starting with 2½-inch Timken detachable bits on 1-inch hexagonal drill steel, the hole was reduced ½ inch in diameter with each 2-foot change in length of drill steel.

Working from the two-level swivel arms of the jumbo, the drifters made twenty-eight holes, four cut holes to take out the center wedge, a roughly circular row of ten holes around it to tear down the rock into the center opening, and the remaining fourteen holes around the outside diameter of the bore to complete the shot after the center load had been relieved.

The holes were loaded with 40 per cent gelatin dynamite on the basis of 6 pounds per cubic yard of rock to be blasted. Electric power was disconnected from the jumbo during the loading operations, illumination for the work being provided by floodlights set

30 feet back of the heading. The four cut holes were loaded with instantaneous exploders, with a single hole on each side loaded with No. 1 delays. Three holes above the cut were loaded with No. 2 delays, and four more holes, two at 11 o'clock and two at 1 o'clock, carried No. 3 delays, and broke down that portion of the top. Two holes at 3 and 9 o'clock carried the shooting to the side with their No. 4 delays; two No. 5 delays kicked down the upper part of the circle; and two more set below the cut started the bottom rising. Two No. 6 delays just outside the lower two No. 5's kicked in from the outer edge, and a single No. 7 in the center below the cut gave relief to increase the effectiveness of the two holes loaded with No. 8 delays on each side of the No. 7 and the two No. 9's directly under it. Two No. 10 delays in the two lower corners finished the round. Shooting was done from a 440-volt line attached to pegs in the tunnel wall opposite the light line and controlled by a switch at the portal.

Mucking

The major part of the mucking was done by a Conway machine taking power from a 440-volt line on the same side of the tunnel as the light line. It loaded into 5-cubic-yard mine cars which were pulled to the waste bank between the tunnels by a G-E storage-battery locomotive. Mucking was commenced within an hour after a shot was fired and was handled fast enough to maintain the schedule of two complete rounds drilled, shot, and mucked in each of the two 9-hour shifts from 8 a.m. to 5 p.m. and 5 p.m. to 2 a.m. Labor shortages increased the difficulty of keeping to that schedule, but for a 6-week period an average of 50 feet per day was maintained, with a top day of 65 feet.

In the headings where the truck-mounted jumbo was used, the mucking was done entirely by the Caterpillar D7 tractor with a bulldozer in front and a cowdozer behind. Although the actual

mucking was slower than when done by the Conway machine, it was possible to clear a working space for the truck-mounted jumbo quite rapidly and also a passageway to the face so that drilling could be resumed while the remainder of the mucking was being completed. In that way the delay in mucking was

overcome. Contractor Wixson feels that 625 feet is the maximum length of tunnel on which this operation is economical, and that controlled the amount of bore made by the truck-mounted outfit except in the south end of the south tunnel where it was used for 900 feet.

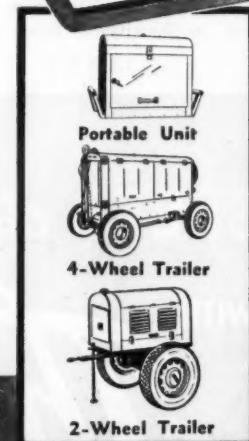
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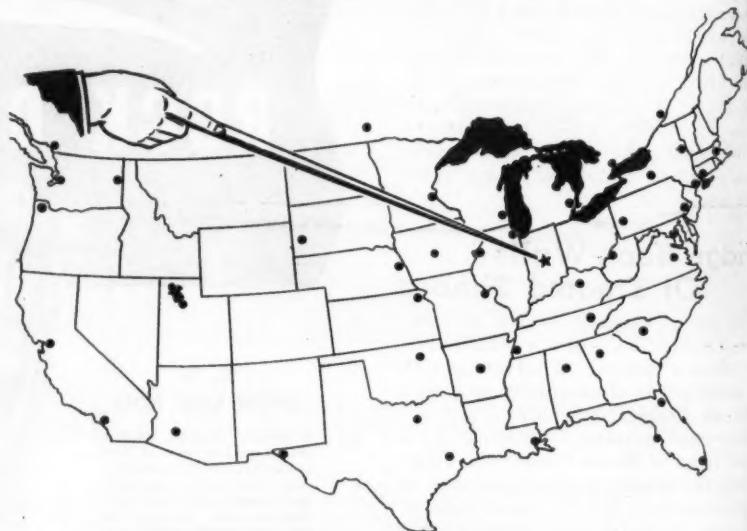


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Driving and Lining Two 11-Foot Tunnels

(Continued from preceding page)

until it holed through.

The tunneling crews consisted of the following for each shift:

- 1 Heading boss
- 1 Walking boss
- 1 Electrician
- 1 Battery-locomotive operators
- 1 Mucking-machine operator
- 8 Miners
- 2 Mechanics
- 1 Dump man
- 1 Powder man (who also made up primers in advance of loading)

The volcanic tuff through which the tunnels were driven was of medium hardness, drilled easily, and broke nicely under shooting. The formation was stable, and less than 100 feet of the two tunnels required timbering. Since the specifications permitted only a 5-inch variation between the line of minimum acceptable thickness of lining and line of maximum size inside which concrete would be paid for, the contractor's interests demanded careful dressing of the tunnel bore.

A special tool was developed which proved most effective in removing excessive projections from the sides and top of the tunnels. The bulldozer blade was removed from a D7 Caterpillar tractor and on the arms which had supported it a cross member was formed of two 6 x 6 x 3/4-inch angles welded together to make a 6-inch-square box girder on which the cable controls of the bulldozer operated to raise or lower it. From this cross member, on the left side of the tractor, a similarly constructed extension was made to a point 14 feet in front of the tractor's rear axle and a diagonal brace run from near the center of the cross member to this point. Removable "stinger points" made of spring leaves from a D8, hard-surfaced with Monel metal, were bolted to this point and used to strip projections from the walls as high as the point would reach. The stinger points were changed after each three hours of use, resurfaced, and put back into service.

For similar work on the roof of the tunnel the same type of tractor was used but the point was mounted on a 16-foot boom, formed of 8-inch 24-pound I-beams cross-braced with 3 x 3 x 3/8-inch angles, and mounted on the front of the tractor frame. The angle of the boom, and the consequent position of the stinger, was controlled by one drum of a two-drum Hyster, and by raising or lowering the boom and changing the direction of the tractor's travel, the projections from the roof or upper walls could be effectively removed.

The Concrete Plant

The contractor set up a concrete proportioning and mixing plant at the south end of the north tunnel and used it during the concrete-lining operations there. When that tunnel was completed, the plant was moved to the north end of the south tunnel. During the change of sites a rather daring move of the three-compartment 120-ton steel bin was successfully made. Two 8 x 24-inch timbers 30 feet long were used as skids tied together transversely and diagonally with 4 x 12's. The batcher was set on these skids without dismantling and the pedestals supporting it fastened to the skids with railroad spikes. A 3/4-inch cable provided a bridle from the skids to a Caterpillar D8 which moved the heavily loaded sled about a mile, over roads having sharp curves and grades up to 3 per cent, in 1 1/2 hours.

As erected at the north portal of the south tunnel, the plant was arranged to take advantage of a hillside. A metal-lined wooden hopper was placed near the top of the cut where trucks could deliver aggregate by end-dumping. It was 8 x 10 feet in size at the top, tapered

to 2 x 3 feet at the bottom 8 feet lower. In its lower front face a 1-foot-square sliding gate permitted discharge onto a 24-inch belt conveyor 50 feet long driven by a 10-hp U. S. motor. This conveyor raised the material about 18 feet to a point above the top center of the three-compartment 120-ton bin, ending over the middle of the center compartment at right angles to the long dimension of the bin so that one compartment was directly under the discharge, one to its right, and the other to its left. Across the short dimension of the bin under the line of travel of the conveyor was a piece of 2-inch pipe on which was pivoted a metal-lined 2 x 16-foot chute. This chute could be tilted in either direction to carry the discharge from the conveyor belt to either of the end compartments or could be slid back under the conveyor so that the material discharged directly into the center compartment.

Under the three-compartment bin was placed a weigh batcher with a Kron

(Continued on next page)

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6 TON CRANE**



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Driving and Lining Two 11-Foot Tunnels

(Continued from preceding page)

scale for proportioning the cubic-yard batches. The platform for the batch operator was extended north and was covered to provide storage for a car-load of paper-sacked cement. Directly under the weigh batcher, its top slightly above deck level, was a metal chute to discharge the entire batch, including the cement, into the drum of a Multi-Foote 27-E paver from which the skip had been removed.

Cement was delivered from storage to a spot beside the charging chute on a 6 x 4-foot flat dolly balanced over a single axle under its center. The axle carried metal baggage-truck wheels about 10 inches in diameter. Twenty sacks of cement could easily be rolled from storage to charging hopper by two men using this device.

Water, coming by gravity from the storage tank on the hill, was accurately proportioned to the batch through a 1½-inch Trident water meter.

The paver was set on a cribbing of cross ties low enough to be charged by gravity from the level of the cement-house deck, but still high enough to permit gravity discharge through a metal chute into the Rex Moto-Mixers mounted on mine cars which were used to carry the concrete into the tunnel. A siding was arranged for spotting the Moto-Mixers under the paver.

At one side of the cement house, and at about the same level as the paver, was housed a General Electric charger for the batteries of the electric locomotives, and nearby was stored a truck-mounted P&H arc welder for use as needed about the job.

Even the method used to load the trucks which delivered aggregates from the Government-furnished stockpiles, ½ mile away, to the proportioning plant was well conceived. A complete 10-foot-long section of the steel tunnel forms was set up near each stockpile of aggregate, and one end closed by a timber bulkhead. The other end was flanked by a wide bulkhead of 2 x 12-inch planks nailed horizontally to 6 x 8-inch posts which were knee-braced in front of the bulkhead. Bulldozers pushed the aggregates over the tunnel forms to permit loading through the 2-foot-square ports in the top section of the form, when a dump truck was backed into the 10-foot section of tunnel form under the pile.

Pouring the Invert

When tunneling was completed, the track was removed and the fine grade for the invert of the concrete lining was made to as nearly exact line and grade as possible by the bulldozer-cowdozer mounted on the D7 tractor. Pieces of 3 x 6-inch lumber 16 feet long were set longitudinally, their upper inside corners at the finished grade of the invert corner. Four 1 x 4-inch stakes driven in holes drilled in the bottom and sides of the rock held these forms to line and grade 9 feet 3⅓ inches apart, and 2 x 6-inch spreaders were used between them at 8-foot intervals, placed just ahead of the concrete pour and removed after the initial set.

Concrete from the proportioning plant at the portal was hauled in steel dump trucks backing in with 2-cubic-yard loads. Rough spreading was done by hand and the final surface contour secured by a transverse strike-off board with four plow handles at its ends and weighing about 150 pounds. Two men dragged the strike-off board forward by ropes while a man on each plow handle operated it to tamp the concrete. Final finishing of the invert was done by six finishers who double-steel-troweled the surface.

Only one 9-hour shift was used in this operation which was continued from north to south through the north tunnel and from south to north through the south tunnel. This one shift averaged 280 linear feet of completed invert containing an average of 95 cubic yards of concrete.

When the invert had been poured and cured sufficiently, the industrial track was relaid on it, the 6 x 6-inch ties being sawed to the radius of the invert to give full bearing. With the track in place on line and grade, a mine car running on it carried a template through the tunnel and two men did whatever final scaling was necessary on the upper walls and roof to permit its passage, thus insuring at least the minimum thickness of concrete lining outside the steel forms when they were set.

Tunnel-Lining Forms

The steel forms used for the remainder of the tunnel lining were made in sections 10 feet long with three seg-

(Continued on next page)

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Above: A complete B-G Central Plant for production of highest type mixes, with Reciprocating Feeder, Cold Elevator, Dual Drum Dryer, Dual Cyclone Dust Collector, Hot Elevator, Gradation Control Unit, and Mixer.

Right: Here's one of the combinations for turning out "intermediate" type mixes. Gradation Control Unit is omitted. This set-up bridges the gap between high-type mixes and the "low cost" type of road mix construction.



Barber-Greene  *Constant Flow Equipment*



Driving and Lining Two 11-Foot Tunnels

(Continued from preceding page)

ments, hinged together at their edges, forming the portion of the lining above the invert for a 10-foot length of tunnel. Each section was of $\frac{1}{4}$ -inch steel plate supported by 5-inch channels, bent to the curve of the horseshoe, at $2\frac{1}{2}$ -foot centers. Ten hinges, five on each side, joined each of the 10-foot segments. A single loop of the hinge attached to the side segment fitted between two loops on the top one and the three loops were pin-connected after being fitted together.

The bottoms of the 5-inch ribs of the side segments were beveled to fit smoothly on the poured invert, with the plate making a perfectly aligned juncture with the edge at exact grade and line. This exact alignment was secured by jacks when the form sections were set. Each rib was provided with a 4×4 -inch plate, welded to project towards the center line, and with a $\frac{3}{4}$ -inch hole in its center into which the hooks of the horizontal jacks were inserted for reducing the width between forms preparatory to moving them.

The top segment of each form was provided with three 2-foot-square ports through which vibrators could be operated, two at the third-points near one end and the third on the center line near the other end of a 10-foot section. One port of similar size was provided near the center of each of the side segments.

Eleven sets of these three-segment form sections were used, giving 110 feet of lining forms to be filled at each pour. The eleven sections were transported on four mine-car trucks with 16-foot axle spacing, the four cars being equally spaced in each 110-foot length of forms. Lengthwise of the mine cars, two 8×8 -inch timbers acted as a frame and across them other 8×8 timbers were placed at the ends. These cross members supported 8×8 -inch vertical posts which were braced to the longitudinal frame by 3×8 -inch boards. On top of the posts, 5-ton hydraulic jacks were used to raise and lower the forms, while ratchet screw jacks provided lateral adjustment and the pull to break the forms in, thus clearing the concave invert and permitting them to be lowered by the hydraulic jacks on top of the carriage.

Placing the Concrete Lining

When the 110 feet of form was set and properly aligned, pouring of the sides and top was started. Concrete from the MultiFoote paver was dumped alternately into the two 3-cubic-yard Rex Moto-Mixers mounted on mine-car trucks, one being loaded while the other was discharging. The same G-E storage-battery locomotives used in the tunneling operation pushed the loads of concrete into the tunnel where they were discharged into an 8-foot chute, made of the bottom half of a 24-inch metal pipe, supported by a wood frame having a drop of 1 foot in 8 feet. This chute discharged the concrete into the hopper of a belt conveyor 24 feet long and 18 inches wide which raised it to the charging hopper of a Rex 160 Pumpcrete machine powered by a 20-hp electric motor.

The 6-inch discharge line of the Pumpcrete rose at a 45-degree angle to the top of the opening between the forms and the roof and extended along this opening to the far end of the 110-foot section. During the pour it was gradually withdrawn by backing the Pumpcrete machine as the form was progressively filled with concrete from the far end. Four Viber electric vibrators with $1\frac{1}{2}$ -inch heads were operated continuously during the placing of con-

crete.

The concrete mix was 1: 2.5: 4.0 with a water-cement ratio of 0.60. Mixing time was $1\frac{1}{2}$ minutes and the actual field weights of the batches had the following averages:

Cement	564 lbs.
Sand	1,350 "
Gravel, $\frac{3}{4}$ -inch	1,060 "
Gravel, $1\frac{1}{2}$ -inch	1,060 "
Water	35 gals.

These proportions produced a concrete having about a 5-inch slump.

The concreting schedule called for pouring a 110-foot length of tunnel between 4 p. m. and midnight, after which the forms were left undisturbed till 8 a. m. At that time the screw jacks were tightened to free the side forms and pull their bases clear of the depressed invert; the hydraulic jacks were lowered so that the form section could drop clear of the crown; and the 110-foot section, supported on the four cars, was moved forward into position for the next pour, raised and spread to its new position, and bulkheaded off at its open end for a new pour to start at 4 p. m.

Pouring the Portals

Concrete placing at the portals was modified slightly since this pour included a 17-foot transition from the horseshoe shape of the tunnel to a section with vertical walls and an arched top, and flared walls connecting the tunnels with the unlined earth canal. These walls, 18 feet high, 6 inches thick, and quite heavily reinforced, are curved and warped to effect the transition in

cross-section of the channel, so that the form setting was quite tedious. Ribs cut to proper shape from 2×12 -inch boards were set at 2-foot centers, and covered with 1×12 -inch sheathing lined with $\frac{1}{4}$ -inch plywood. The loads of concrete were not agitated during transit but the truck-mixers were connected to a 100-kw generator mounted on a truck and stationed near the portal to furnish

(Concluded on next page, Col. 2)

Engines FROM 90 to 215 HP. Generators FROM 60 to 115 KW

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MURPHY DIESEL

More Profit

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75% to 100% larger, air-animated valves for free air flow, greater coolness, lower lift and, consequently, longer life.

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100% efficient intercooling (with automatic drainage during idling periods) delivers air under 100 lbs. pressure within 100° of ambient temperature.

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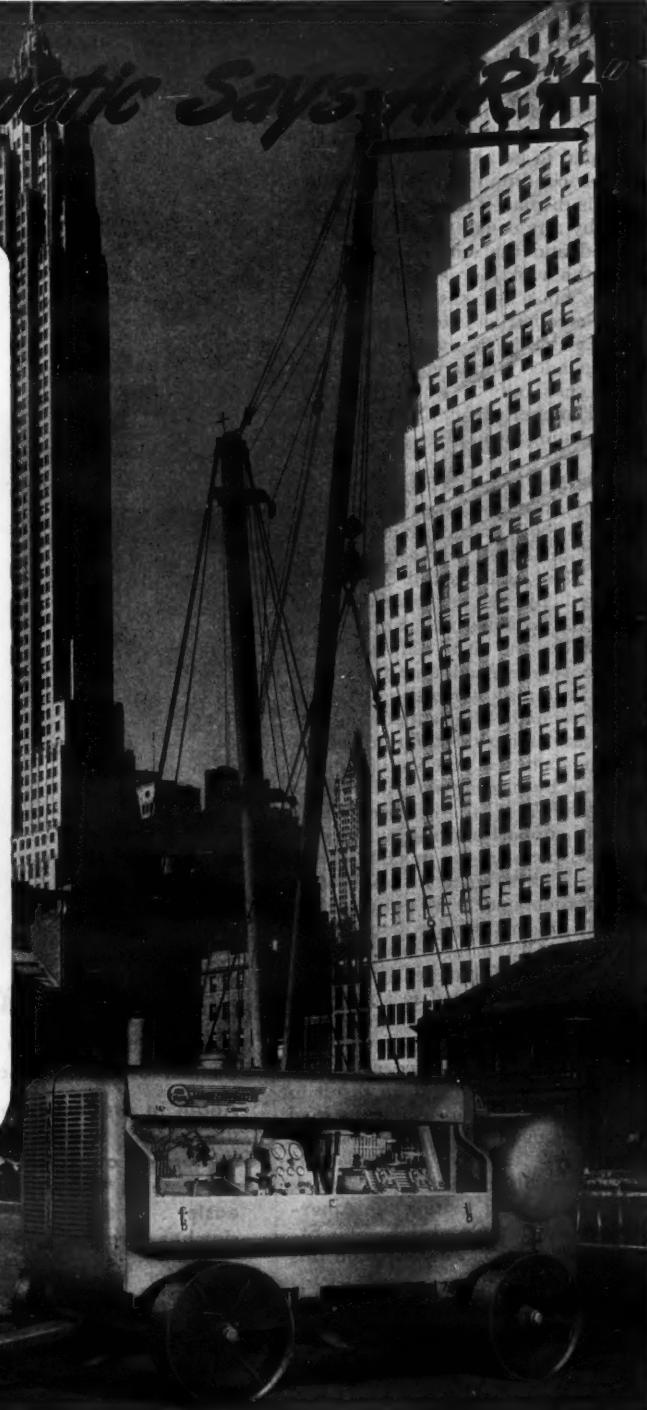
100% positive force feed lubrication, protecting under all operating conditions.

60 to 500 cu. ft. models, offering as standard these and many other "PLUS" features (more horsepower, huskier main frames, lifetime clutches, bigger tool boxes, sectional radiators and intercoolers, interchangeable Timken bearing steel and pneumatic tired wheels, "Auto-Steer" axle on all 4-wheel trailers, etc.) are available thru ...

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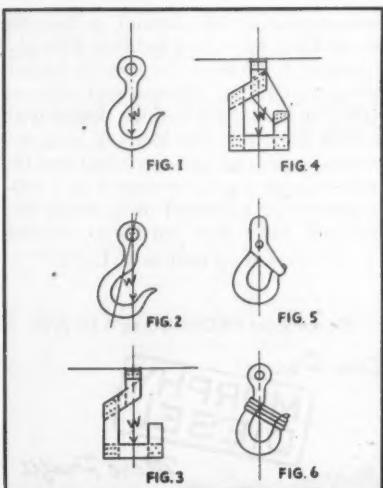
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Leaders



"SPEEDLINE"
Concrete Mixers



"SURE PRIME"
Contractors Pumps



The development of safety hooks.

Hoist Hook Safety—Theory and Practice

"One of man's most useful devices and one of the most ancient" is the characterization given the hook, which is found in its most primitive form in man's own fingers. Though simple in principle and design, the hook requires an intricate calculation to adapt it mathematically for a given load.

Designed primarily to take the load on its geometrical center (Fig. 1), a hook is said to be in stable equilibrium when this condition maintains. When the load is displaced towards the hook's opening by any cause (Fig. 2), stress is intensified and the danger of the load jumping the hook increased. Principles governing hook stresses are illustrated in a hook constructed of metal plates (Fig. 3), which in its nature is a cantilever suspended from a cantilever, each of which has only a small degree of fixity and comparatively little resistance against turning around their points of support.

The insertion of a tie (Fig. 4) changes this, giving, in effect, a beam positively supported at both ends, with consequent reduction in stress and increase in stability. The ACLC safety hook (Fig. 5), devised by the American Chain Ladder Co., provides the same effects as such a tie, the firm claims. These hooks are so designed that the safety tie comes into play when the deflection point is reached, thus supporting the hook and imparting the safety measure.

The time-honored practice of "mousing" a hook by passing several parts of rope around it (Fig. 6) provides a measure of support and safety but is at best unsatisfactory, the maker of the ACLC hook says, since its application consumes time and it is entirely impracticable in the regular handling of loads. The ACLC safety hoist hook, on the other hand, automatically engages and releases as the load is applied or removed. Automatic and simple in operation, it is designed to give rapid handling and a high degree of safety. The patented shoulder and lip result in a wide safety margin in which the load will not shift even if the bolt shears, it is claimed.

Further details on this safety hook may be obtained by writing the American Chain Ladder Co., 151 E. 50th St., New York 22, N. Y. Just mention this item.

MOVING? Be sure to give us 30 days' notice of your change of address—and let us have your old as well as your new address.

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CONTRACTORS AND ENGINEERS
MONTHLY

470 Fourth Ave., New York 16, N.Y.

Driving and Lining Two 11-Foot Tunnels

(Continued from preceding page)

power for their discharge as well as for the Pumpcrete machine placed 30 feet inside the tunnel.

From the Pumpcrete a 20-foot length of pipe ran straight forward and was connected to a half-circle pipe which delivered the concrete into the 17-foot full-diameter transition section.

When that portion of the pour was completed, the half-circle pipe was replaced by various bends and risers necessary to get the concrete into the flared-wall section. To eliminate the possibility of clogging during the delays incident to these line changes, a 2-inch air connection was placed in the line just in front of the Pumpcrete and blown before each shut-down, using air at 150-pound pressure from a Gardner-Denver 365-cfm compressor mounted, with a Caterpillar D13000 power plant, on a truck chassis nearby. Despite the

frequent concrete-line changes entailed by this pour, 71 cubic yards was placed in 9 hours.

Major Quantities

The contract for this work was awarded under two schedules and the principal bid items of each included the following:

	Schedule No. 1	Schedule No. 2
Tunnel excavation, unclassified	18,250 cu. yds.	17,950 cu. yds.
Permanent timbering in tunnel	60 MFBM	60 MFBM
Concrete in portals and transition	190 cu. yds.	180 cu. yds.
Concrete in tunnel lining	4,020 cu. yds.	3,950 cu. yds.
Placing reinforcing steel	19,000 lbs.	18,000 lbs.

Personnel

The contracts for these two tunnels on the Deschutes Irrigation Project were awarded to Wixson & Crowe, Redding, Calif., by the U. S. Bureau of Reclamation on March 25, 1944. The contract amounts were \$227,745 on Schedule 1 and \$223,945 on Schedule 2, and 330 calendar days were allowed for

completion of both schedules. S. L. Wixson was his own Superintendent and is responsible for the many ingenious methods contrived to expedite the construction. For the Bureau of Reclamation, the work was under the direction of C. H. Spencer, Construction Engineer of the Deschutes Project. Lewis Spangler, Engineer, was in charge of inspection at the job site. Frank A. Banks is Regional Director of Region I in which the project is situated.

Du Pont Personnel Changes

Dr. Lawton A. Burrows has been appointed Assistant Manager in charge of research for the Technical Division of the Explosives Department of E. I. du Pont de Nemours & Co., succeeding Dr. W. E. Lawson, who has been assigned to special duties. Dr. Wesley M. Nagle, a section head in the Explosives Department, has been appointed Assistant Director at the firm's Eastern Laboratory, Gibbstown, N. J.



COMING YOUR WAY Model A-D Motor Grader

...NOW BACK IN PRODUCTION...A BETTER MACHINE THAN EVER!

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MORE POWER — 75 Diesel brake h.p. . . . more than any other motor grader.

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THE CLUTCH — larger capacity, longer life, easier to operate.

NEW CLUTCH MECHANISM — easier operation, better service.

ELECTRIC BRAKES — first time on road graders. No adjustment, no high pressure tubing, no vapor-locks — far easier to operate.

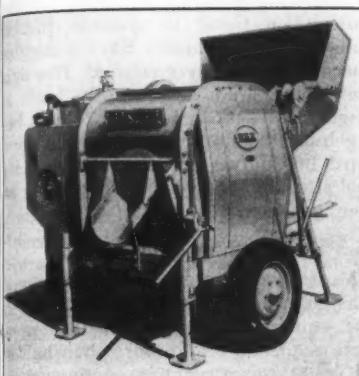
IMPROVED TRANSFER GEAR — gears automatically locked in place — no jumping out of mesh.

LEVER CONTROL — leverage redesigned in control box to give approximately 30 per cent easier operation.

FUEL INSTRUMENTS — eliminate all tubing on machine except fuel lines.

LEANING FRONT WHEELS — leaning front wheels easier to operate.

IN ALL — SOME IMPROVEMENTS HAVE BEEN MADE



A new Rex 6-S concrete mixer, one of the completely redesigned line recently announced by Chain Belt Co.

Rex 6, 11, and 16-S Mixers Redesigned

A completely redesigned streamlined chassis features the new Rex concrete mixers, the Chain Belt Co., 1666 W. Bruce St., Milwaukee 4, Wis., has announced. This firm manufactures pumps and pavers as well as mixers.

First to enter actual production, the Rex 6-S has a chassis with low overall height, wide wheel tread, and low center of gravity for easy parking, towing, or spotting. New controls, grouped at one side of the machine, a new water system, and a new drum design are said to make for easier operation and better mixing.

AGC standards are met by the redesigned 11 and 16-S mixers, the former being available in an end-discharge type, with either 2 or 4-wheel mount, and the latter in the 4-wheel mount, either end or side discharge. Improvements include the relocation of lubrication fittings for convenient greasing, choice of air and water-cooled engines, redesigned water system, and a new slip-stream shimmey skip.

Further information on these new mixers and their availability may be secured direct from the manufacturer. Just mention this news item.

Air-Entraining Agent

Discussed in Booklets

Two new booklets on controlled air entrainment in concrete through the use of Darex AEA have been issued by the Dewey & Almy Chemical Co., Cambridge 40, Mass., and are available to readers who mention this item. One, a 20-page "Manual," tells how to estimate the quantity of the product needed for any specific job, with examples of its application in various grades of concrete mixes. Mixing tables, conversion tables, data on Darex AEA effects on compressive strengths, a method of maintaining the specified cement factor, hints on mixing Darex AEA, and various other charts are included.

Stating that it is controlled air that really counts in air-entrained concretes, the second booklet, a 4-page brochure, Form 96-45-2, describes the properties of Darex AEA. A water-soluble compound that comes ready to use, this agent has the property of controlling the amount of entrained air, the brochure claims, since it works on the sand constituent of the concrete as an air-entraining agent, and does not react with the alkali in the cement. "The air entrainment is a mechanical action that is controllable and depends on the amount of Darex AEA used", the booklet states.

Clay-Pipe Standards

The Division of Simplified Practice of the National Bureau of Standards has announced the printing of "Simplified Practice Recommendation R211-45, Clay Sewer Pipe and Fittings". The recommendation lists the variety of standard-strength and extra-strength pipe and fittings to be considered as stock items, and is divided into two

schedules. Schedule A lists 348 standard-strength items and 192 extra-strength. Schedule B, for the West Coast, gives 320 standard-strength and 228 extra-strength items. The number of items recommended in each schedule is approximately one-third of the 1,500 to 1,600 varieties formerly carried by the sewer-pipe industry.

Copies of R211-45 may be secured from the Superintendent of Documents, Washington 25, D. C. The price is 10 cents each.

Brazilian Dealer Named

Sales and service facilities for users of their excavating and materials-handling equipment in Brazil have been made available through the appointment of Udo Riedel as distributor for the Osgood Co. and the General Excavator Co., both of Marion, Ohio. The Riedel organization, which has branches in both Rio de Janeiro and Sao Paulo, employs 70 mechanics in its service and repair shop in the latter city.

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Use this CONNERY oil-burning Patrol Patching Heater on the small kettle for large-quantity production.



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A shoe that doesn't fit, pinches your foot. And equipment that doesn't fit your job, pinches your pocketbook.

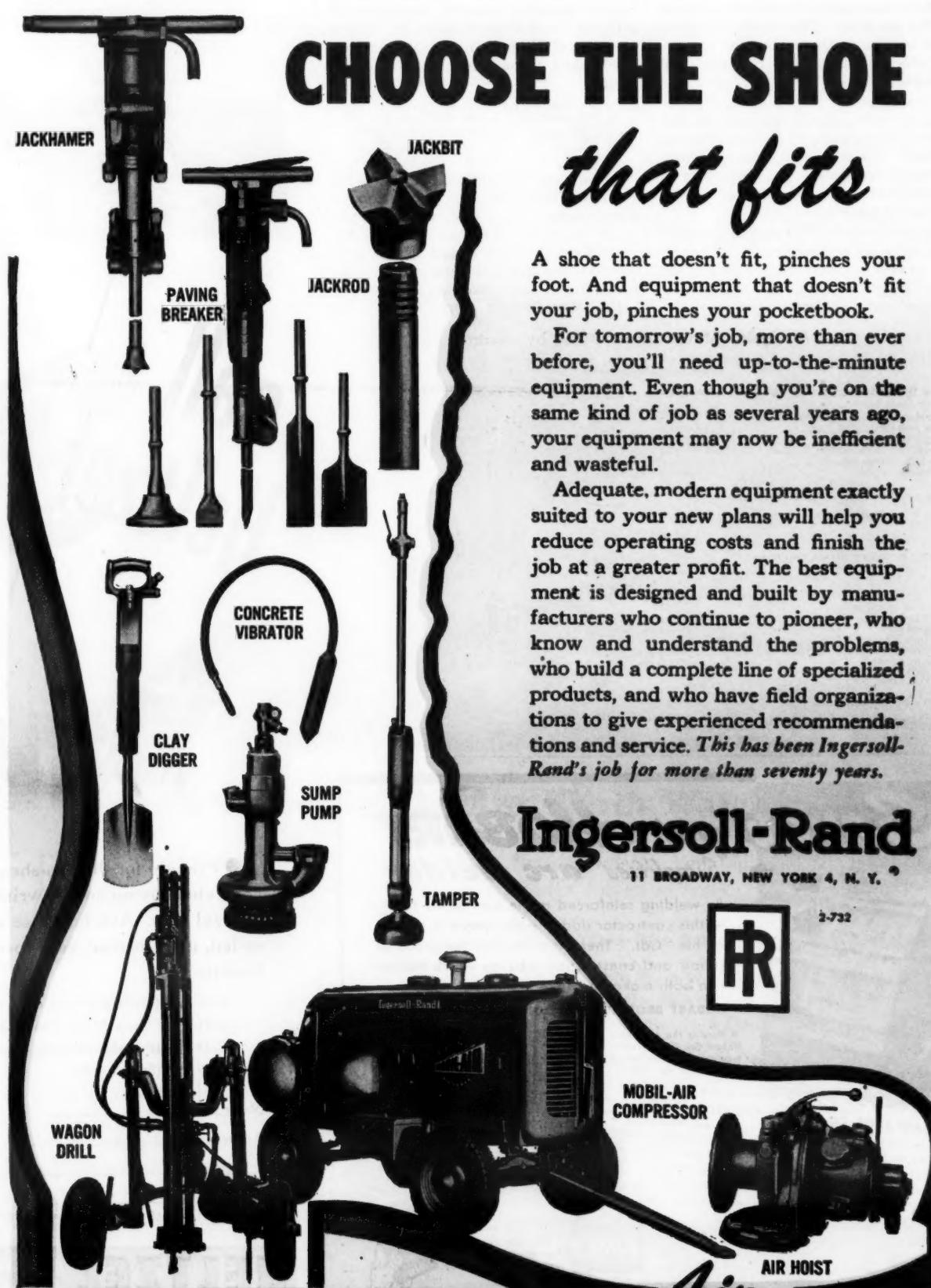
For tomorrow's job, more than ever before, you'll need up-to-the-minute equipment. Even though you're on the same kind of job as several years ago, your equipment may now be inefficient and wasteful.

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INGERSOLL-RAND COMPRESSED Air POWER



Public Roads Administration Photos

This road in Clarke County, Wash., which carries heavy logging and farm traffic, is surfaced with $2\frac{1}{2}$ inches of road-mix, the texture of which is shown at the right.

Hints to Aid Counties In Road Maintenance

(Continued from page 6)

taining rock surfaces, many counties are planning to bituminous-treat a large mileage of this type in the post-war era, and have accumulated substantial funds for this purpose. The results, in some cases, will be disappointing and expensive, due to insufficient drainage and inadequate base.

Drainage in this area is generally satisfactory on a small portion of the county road mileage where heavy traffic is found. Elsewhere such maintenance is usually inadequate, due primarily to the high cost of hand ditch cleaning and disposal of material.

A loader, which was originally developed by a state highway department, has recently found much favor. In Washington, twenty of the thirty-nine counties, and in Oregon, eleven of the

thirty-six counties have purchased thirty-four of these machines. None has been acquired by Montana or Idaho counties. Use of this equipment has reduced the cost of ditch cleaning and disposal of spoil from \$75 to \$100 per mile by hand methods, to from \$25 to \$60 per mile. Material cost for complete removal and disposal has varied from 53 to 64 cents per cubic yard as compared with \$1.00 with hand methods. A typical operation recently completed 62 miles of heavy ditch cleaning in 15 days at a cost of \$48 per mile or 64 cents per cubic yard, using the following equipment:

1 four-wheel-drive truck at \$16.00 per day
1 pull grader at 10.00 per day
4 trucks at 5.50 ea. per day
1 motor grader at 8.00 per day
1 pick-up at 3.25 per day
1 loader at 20.00 per day

In another operation, 23,500 cubic yards of ditch cleanings were removed and disposed of at a cost of 43 cents per cubic yard. The machine is also useful in picking up pre-mixed bituminous material, loading aggregates from stockpiles, and in light grading operations.

Probably 95 per cent of the 5,000

miles of bituminous surface in the region is a light penetration type not over $1\frac{1}{2}$ inches in thickness, the balance being largely road-mix, from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches in thickness. Most of the counties in Oregon and Washington are equipped for oil patching and sealing. Three or four counties in Montana and only a few of the more densely populated districts

in Idaho are partially equipped for this work. The trend is towards thicker mats in those counties having logging operations and heavy rainfall. The light penetration mats are usually built as stage construction, one or two lifts being built the first year, followed by a third lift in two or three years and a seal after another year. The cost per lift averages from \$750 to \$800 per mile.

Crushing Equipment

Most of the counties in Oregon and Washington crush aggregate with their own equipment, generally with permanent plants. In Idaho more than half of the counties contract aggregate production, and in Montana three or four counties have their own crushing plants. Others have small plants or secure rock from state-highway-project contractors. Few accurately compiled crushing costs are available. One county which keeps excellent records of all operations reports the cost of producing $\frac{3}{4}$ -inch-minus oil rock at 90 cents per cubic

(Continued on next page)

USE THE COUPON TO OBTAIN THESE HELTZEL BULLETINS

- T-29-CB (General Duty Concrete Buckets)
B-31 (Truck Mixer Charging Plants)
C-34 (Portable Batching Bins)
B-19 (Steel Forms)



• Prepare for the "go-ahead" signal on concrete construction by writing or calling Heltzel now. Ask for these engineering-styled, easy-to-read, easy-to-use, Heltzel bulletins:

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(Type of construction usually engaged in)

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By welding reinforced angle iron to the tracks —this contractor added many years to the life of his "Cat." There are literally hundreds of repair and construction jobs on which Hobart can both make and save money for you.

HOBART BROTHERS CO., BOX CE-125, TROY, OHIO

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I'm interested in finding out what Hobart Arc Welders can do for me on my work. Am especially interested in:

Hobart Gas Drive Send free book "Vest Pocket Guide for Welders"

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FREE! "Vest Pocket Guide for Welders." Get valuable copy today.

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Hints to Aid Counties In Road Maintenance

(Continued from preceding page)

yard and 1½-inch surfacing rock at 75 cents per cubic yard. This was in a plant remodeled in 1942, requiring an operating crew of six men and with an average production of 350 cubic yards per day. While post-war costs are expected to be higher generally, this county expects to reduce costs by the purchase and operation of a semi-portable plant, electric and diesel-operated, employing four men, with a daily production of 800 cubic yards. One county which contracts all rock production reports a pre-war cost of 60 to 85 cents per cubic yard in stockpiles. Contract prices in that area at the present time range from \$1.00 to \$1.25 per cubic yard.

Considerable interest is found in semi-portable plants, and a number of counties, in areas where the material to be crushed is largely oversize gravel, are considering the purchase of these units. Ledge rock requires a heavy primary breaker. Semi-portable plants are favored over portable plants as it is more economical to crush and stockpile for two or three years in one location.

Asphalt Economics

Storage of asphalt, rather than delivery from railroad tank cars, has proved economical. One county saves \$7.00 per ton with a 40,000-gallon-capacity storage plant. The asphalt is hauled a distance of approximately 50 miles by motor transport at a cost of \$1.90 a ton for a total delivered cost in the county's tanks of \$15.80 per ton plus heating cost, as compared with a delivered cost of \$22.90 by railroad tank car plus heating cost. Storage is in cylindrical tanks consisting of six salvaged donkey-engine boilers from which the tubes have been removed. These were purchased from logging companies at a cost of 3 to 6 cents per gallon of capacity, which varies from 1,800 to 5,000 gallons. All tanks will eventually be connected and drained by gravity into a 16,200-gallon rectangular tank for full heating. The contents of this tank can be heated to 225 degrees in 6 hours by means of steam from a salvaged donkey boiler, burning fuel oil. This boiler also furnishes hot water for washing equipment. For rapid heating of a distributor load, one 1,800-gallon tank is used as a superheater. The superheater coil consists of two header pipes 40 inches long at one end of the tank, to which are attached loops of 1½-inch pipe spaced 2½ inches apart and running the length of the tank. Pipes are placed as near the bottom of the tank as possible, as it is difficult to heat oil under the pipes. It is planned to insulate the tanks with rock-wool and car-siding.

Maintenance by Contract

One county in Washington performs all but routine maintenance by contract. This county owns no crushing plants, oiling equipment, or shovels. It has nine heavy-duty diesel patrol graders for blading some 800 miles of gravel roads, and a number of light trucks. All surfacing, oiling, loading, and hauling of material are performed by contract or by equipment rented from contractors. An average of 35 to 40 miles is oiled each year at an average cost of \$1,754 per mile for two lifts of 20-foot roadway.

Before the war, ¾-inch-minus rock cost from 60 to 85 cents, stockpiled at the crusher site, while the cost at the present time ranges from \$1.00 to \$1.25 per cubic yard. Hauling costs are at present 16 cents per cubic-yard-mile for the first mile and 11 cents for each additional mile. Shovel loading, pre-war, cost 10 cents a cubic yard, but this is expected to cost 20 cents per cubic yard. A cost analysis of the most recent oiling done by this county, in 1941, is shown in the table on the opposite page.

County Problems

Due to the small size of many counties, they are at an economic disadvantage. The strictest economy, in-



Public Roads Administration Photo
Motor transport and storage of asphalt instead of railroad tank-car delivery has saved one county in the Pacific Northwest as much as \$7.00 a ton. Here is the set-up for asphalt storage in Skagit County, Wash., showing the heating-plant house, and the storage tanks in the background.

genuity, and unified control with good engineering and business management are essential to provide adequate maintenance within the funds available.

Some are at a particular disadvantage in regard to equipment. Frequently a county has not enough money to buy

(Concluded on next page, Col. 2)



Job-Rated Trucks Are Worth Watching

PLenty of eye-opening facts about truck economy are revealed to those who watch Dodge Job-Rated trucks in action.

It's easy to understand.

Each Dodge truck has a powerful *Job-Rated* engine . . . the *right* power to handle your loads *economically*.

Each Dodge truck has a *Job-Rated* transmission and clutch. It has a *Job-Rated* frame . . . *Job-Rated* springs, axles, and tires. And it's engineered and precision-built throughout to fit the job . . . for performance, for endurance, and for economy.

When you again buy new trucks, standardize

for dependable long-pull economy . . . on Dodge *Job-Rated* trucks.

ORDER YOUR NEW DODGE JOB-RATED TRUCK NOW

Dodge dealers are now taking orders for new Dodge *Job-Rated* trucks. See your dealer about the *economy* truck for your job . . . a Dodge *Job-Rated* truck.

Truck Parts Are Important—Owners tell us they'll long remember the quick wartime availability of factory-engineered Dodge truck parts. Parts when you need them: that's the Dodge way . . . your protection from costly delay.

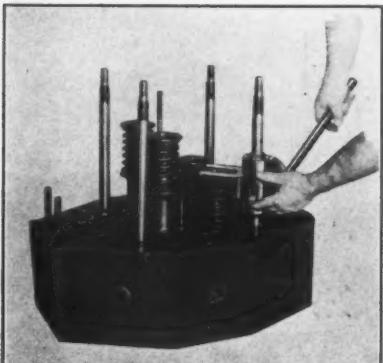
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FIT THE JOB . . . LAST LONGER

TNT Increases
POWER and
S-P-E-E-D
SAVES FUEL
For NEW Motor Performance
Used With All Types Fuels and Oils.
Keeps Engines Clean Internally.
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CHAMPION CHEMICAL CO.
STEPHENVILLE, TEXAS

BUY VICTORY BONDS



The Safe-N-Ezy valve-spring depressor speeds the dismantling or assembly of all types of diesel-engine valves.

New Tool Aids Work On Valves in Diesels

A valve-spring depressor for one-man operation in dismantling and assembling diesel-engine valves has been introduced by the Paxton Diesel Engineering Co., Omaha 5, Nebr. Available in sizes and models to fit all modern diesel engines, the Safe-N-Ezy valve-spring depressor is said to outmode all lever and fulcrum spring gadgets. It compresses the valve spring to any point, and holds it at that point, leaving the mechanic's hands free to remove the keepers and pin. The device does not nick the stud, and is so designed that the spring can be released safely and simply.

Shop superintendents for contractors and state or county highway departments may secure further details and prices on this handy light-weight tool by directing their inquiries to the manufacturer and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Robins Executive Abroad

England and the European Continent will use more American-built machinery than in previous years, E. C. Salzman, Vice President in charge of exports for Robins Conveyors Inc., Passaic, N. J., predicted before leaving for England recently. Stationed there for 14 years before the war, he has returned to supervise the reorganization of the materials-handling department of Fraser & Chalmers Engineering Works in Kent, which was under Robins direction before the war, and to survey the need for Robins equipment in rebuilding war-damaged areas.

OVER 25 YEARS A BUILDER OF BUCKETS



You'll like this sturdy Erie 2-line clamshell that combines block and tackle plus leverage to achieve the greatest digging power for its weight ever designed in this type of bucket. Available in 11 standard sizes from $\frac{1}{2}$ yd. thru $2\frac{1}{2}$ yd. Write for bulletin No. 28-1552. Let's have your bucket problem.

Write for new bulletin. Address 2512 Geist Road.

ERIE STEEL CONSTRUCTION CO.

ERIE, PENNSYLVANIA

Aggregates • Buckets • Concrete Plants • Traveling Cranes

Hints to Aid Counties In Road Maintenance (Continued from preceding page)

both a heavy and a light piece of equipment. There are certain types of heavy equipment which a county could use to advantage for short periods. It is frequently the practice to buy the heavy outfit since one is all that can be afforded. In such instances economy has been sacrificed, as the lighter equipment would be more economical for the major part of the work. In many counties the purchase and operation of special heavy equipment is not economical due to the short time such equipment may be necessary. A simple accounting system and an equipment-rental plan help to avoid these situations.

It is gratifying to observe that the solution to many local maintenance problems is being found in some counties through close cooperation between these governmental units by exchange of services and ideas with each other and with state highway departments. The employment of a capable engineering management also is a credit to the administrative heads of those counties.

Theory of Structures

A new volume on the theory of structures written for the student, but excellent as a review course for the thousands who are reorienting themselves in this post-war world, has recently been prepared by S. Timoshenko, Professor of Theoretical and Applied Mechanics, and D. H. Young, Associate Professor of Civil Engineering, of Stanford University. The authors' avowed intention is to base the book on mechanics with which the student or engineer should already be familiar.

Starting with a review of the basic principles of statics, the study continues through the analysis of statically determinate trusses in one plane and then takes up influence lines. Hinged joint trusses, another review in mechanics leading to the subject of statically indeterminate structures, calculating truss deflections, the bending of beams and frames, and finally the theory of arches takes the reader through the various analytical steps in the design of structures.

The book, priced at \$5.00, may be secured from McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y.

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Wet Snow Presents Problems in Removal

(Continued from page 1)

igan in the northwest corner of the state around the Gary steel center. This section is traversed by many busy highways feeding into Chicago, a few miles further up the lake. Because of customary strong winter winds and resultant drifts, the roads in this area require careful maintenance if high-speed and commercial traffic is not to be retarded or endangered.

The Highway Commission has six districts throughout the state, which in turn are each divided into six subdistricts. The two districts in which the bulk of the snow fighting occurs are located at Fort Wayne in the northeast, and at La Porte in the northwest section of Indiana. Of the thirty-six subdistricts in the state, ten lie in the northern counties subject to heavy snow. Working out of each subdistrict office are twelve patrolmen who have the responsibility of clearing snow from the roads.

The snow-removal equipment in each subdistrict usually consists of four trucks, two large units from 3½ to 5-ton size outfitted with underbody blades and two-way plows, and two smaller units, either 1½ or 2-ton trucks with one-way plows. The larger trucks are always manned by two men, one of whom is needed to lift the heavy plow at railroad crossings. When the snowfall is light, one man is usually sufficient to operate a smaller truck. Rotary plows have not been used. Snow is generally expected during the months of January, February, and March, but the 18-inch fall which visited this sector in February, 1945, was the greatest with which the Highway Commission has had to cope in recent years.

Advance Preparations

Preparation for snow removal really begins at the close of each winter season. Snow plows are then removed from the trucks, painted, repaired and put in first-class shape, and stored either at the subdistrict garages or at the headquarters of the patrol crews. Snow fence is also taken down, repaired, and stored in like manner for the next year.

During the summer, weeds, brush,



After initial clearing of snow from the highways in Indiana, the snow is pushed back still further by wings to make room for subsequent plowing.

and heavy vegetation are cut from the right-of-way to prevent the piling up of snow drifts, and ditches are cleaned to provide for a rapid run-off of water when thawing occurs. About the first of November snow fence is erected along sections of road subject to drifting, and in most cases is located from

100 to 150 feet from the edge of the pavement. Drifting is usually prevalent on roadways of narrow right-of-way and in cut sections.

Several months prior to the winter season, abrasives, usually sand or cinders, are purchased and treated with calcium chloride or salt, using a mix-

ture of about 1 to 1½ bags per cubic yard of abrasives. This treatment keeps the abrasives loose and permits them to flow freely in truck bodies and into mechanical spreaders, and prevents the material from freezing when placed in stockpiles in the open. Large stockpiles are so placed in each subdistrict that loading, hauling, and handling are reduced to a minimum. At critical locations, such as railroad crossings, overpasses, underpasses, curves, and hills, numerous small stockpiles are placed at intervals of from 50 to 100 feet on the shoulder. This increases the efficiency of the patrols in the application of abrasives on sections of roads where snow and ice conditions may curtail the movement of traffic.

Snow Removal

As soon as a storm breaks, the patrolmen, who are subject to call 24 hours of the day during the winter months, assemble their crews and begin work. Any snow up to 6 inches can usually be

(Concluded on next page)

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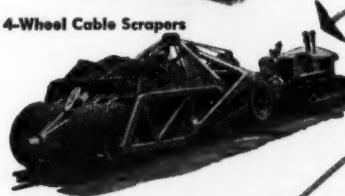
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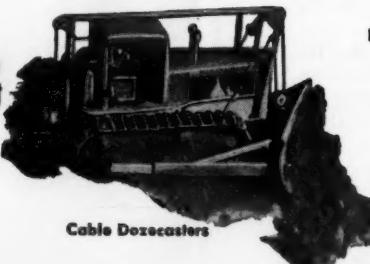
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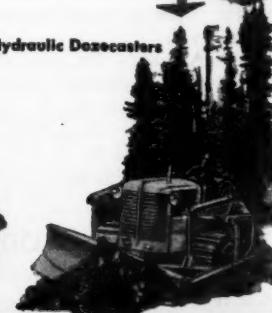
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Wet Snow Presents Problems in Removal

(Continued from preceding page)

handled successfully with one-way plows, providing drifting does not occur. Attached to lighter higher-speed trucks, these plows are sent out to clean the pavements as soon as possible and prevent packing by traffic.

On two-lane pavements these one-way plows clear one-half the road at a time. On dual-type pavements and pavements over two lanes wide, the use of two or more one-way plows working in echelon is required in order to clean satisfactorily one-half the pavement. After the storm has abated and the pavements have been cleared, locations which may be slippery due to packed snow or ice are sanded or cindered, either by hand or by the use of automatic spreaders. This condition usually exists at railroad crossings, hills, curves, grade separations, and intersections.

After this operation is completed, all mail-box approaches and intersections are plowed free of snow. Following this, the plows shove the snow from the shoulders to the ditch line in order to prevent freezing and thawing on the pavements, and to give more adequate run-off when thawing occurs. It is also a protective measure if additional snow falls within the next few days.

When snowstorms reach blizzard proportions accompanied by drifting and the depth is greater than 6 inches, it is then necessary to combat them by using the two-way or V-type plows attached to large trucks. Whenever possible these drifts are plowed to the right-of-way limits.

Ice Control

Ice control is probably the greatest problem of the winter, and perfect results are difficult to obtain. When ice begins to form on the pavements, the underbody graders and the blades on pull-type and power graders are about the only equipment which will aid in this phase of the work. Ice up to 1 inch thick can be bladed from the pavement with this equipment, provided calcium chloride or salt is applied prior to the removal operation.

When this type of equipment fails to accomplish any results, the only alternative is to apply abrasives. After hazardous locations have been sanded or cindered, the remaining sections of the road are worked on in order to reduce the traffic hazard to a minimum. As soon as thawing occurs, the ice formation softens and breaks, and is then removed by the use of the various types of graders.

Standards Maintained

In the past two years the lack of new equipment, the man-power shortage, and the problem of obtaining parts for equipment increased the difficulty of snow removal and ice control. However, sustained vigilance and untiring efforts on the part of those men who perform this work kept the standards of winter highway maintenance at the pre-war level.

The Maintenance Division of the Indiana State Highway Commission, which does this work, is headed by Charles T. Miser, Superintendent of Maintenance, while F. S. Hill is Field Engineer of Maintenance.

Play Safe When Oiling

An oiler on a crane removed a guard from a hoist-drum drive gear and put his arm between the spokes to oil the shaft while the machine was idling. When the operator started the crane, the oiler's hand and shoulders were pulled into the drum, resulting in death.

Another oiler was greasing gears with



This photo of one of Indiana's snow-plow outfits shows the type of plow mounting.

a wooden paddle which caught in the gears, resulting in the loss of three fingers. Lurching movements of a crane often cause oilers to lose balance and become caught in gears, fans, or shafts.

There should be close coordination between equipment crew members, a

recent issue of Construction Safety points out. A brief shut-down during each shift will provide time for routine adjustments and lubrication. One way of doing this is to have the oiler do some of his work during the lunch period while the crane is not operating.

Big Construction Jobs

• Run on Rubber Tires

A new publication dedicated "to America's big jobs, the men behind them, and the mighty equipment that makes them possible" has made its initial appearance under the sponsorship of the Goodyear Tire & Rubber Co., Akron 16, Ohio. It deals with the personalities of a number of our leading contractors and their use of large construction equipment on off-the-road rubber tires.

In the first issue is a page of news as broad as the publication is Big, which is its name. Then follow articles on the New York Municipal Airport at Idlewild; the Brothers Riegel, who moved sand there, and rock on the Delaware Aqueduct; F. W. Hooper, construction man and Derby winner owner; dirt moving at Oak Ridge, Tenn.; news photos; a big timber story; the dirt-moving wagons of M-R-S; and a concluding sports letter.

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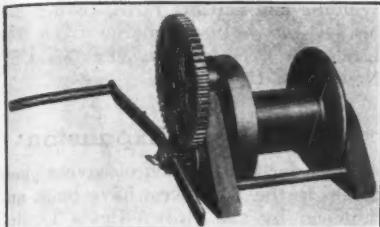
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A new hand winch has been announced by American Hoist & Derrick Co.

New Hand Winch Has Big Single-Line Pull

Capable of handling a 10,000-pound load, though it weighs only 95 pounds, a new all-steel hand winch has been announced by the American Hoist & Derrick Co., Robert & Water Sts., St. Paul 1, Minn. Details may be secured by writing to the firm and mentioning this notice.

The Handiwinch can achieve a 10,000-pound single-line pull using a 20-inch crank with a 70-pound crank load and a 27:1 gear reduction. A reduction of 4½:1 will produce a 1,900-pound single-line pull, with similar crank length and load. The winch is 16½ x 15½ x 16¾ inches high, and has self-lubricating bronze bushings throughout, except in the drum where oil holes are provided. The crank assembly weighs 7½ pounds, and the tail yoke, 5 pounds.

Spring Start Planned On Maine Toll Road

Construction on Maine's proposed Kittery to Fort Kent expressway is scheduled to start next spring, according to a recent announcement by Governor Horace Hildreth. This four-lane toll road is to be built by the Maine Turnpike Authority, which was recently created for that purpose.

The first section of the expressway to be constructed will be 50 miles in length, extending from Kittery to Portland, is estimated to cost \$13,000,000, and is scheduled for completion in 1948. Surveys for the second section, between Portland and points north, will be made at an early date.

According to present plans, this route will connect with an expressway planned by New Hampshire and at the Maine-Massachusetts line with another expressway proposed by Massachusetts. The latter route in turn would connect with proposed express highways in Connecticut and New York. Included in the plans for the Maine turnpike are two Flight Strips for airplanes, adjacent to the highway.

This project will be financed entirely by tolls from automobiles and trucks using the route. Because of the amount of tourist travel through the state, it is believed that considerable revenue will be derived from out-of-state cars which would prefer this route because of its lack of cross roads, traffic signals, pedestrian travel, and roadside billboards. In the entire 50-mile length of the first section, there will be only eighteen curves, none sharper than 1 per cent. It is estimated that 30 minutes' driving time will be saved between Portland and Kittery, with even greater savings on weekends when travel is particularly heavy.

The highway will have two 24-foot concrete roadways, separated by a 26-foot dividing strip, with 4-foot treated-gravel shoulders on the outside lanes, and will be located west of the present U. S. 1, the principal highway leading into Maine.

The traffic survey was made by Coverdale & Colpitts, Engineers, New York City, and financing of the project arranged on the basis of their report to the Turnpike Authority. Howard, Needles, Tammen & Bergendoff of New York City are serving as consulting engineers for the Maine Turnpike Authority.

New Rotary Pump Is Self-Adjusting

A new special rotary pumping unit for handling bunker "C" fuel oil and liquids with similar characteristics has been developed by the Blackmer Pump Co. Operating on the "bucket"-design (swinging-vane) principle, the pump is self-adjusting for wear, with no loss in capacity during the life of the buckets, the maker says.

When worn the buckets may be replaced by removing the pump head and inserting new ones. This restores the pump to normal capacity, and no adjustments or "wearing in" is needed. The bronze-fitted pump has a 500-gpm capacity, and operates at 125-psi pressure. A 50-hp gearhead motor capable of 150 rpm, with a drive shaft connected to the pump by a flexible coupling, forms the power unit.

Further information on the new pump may be secured by readers who write to the Blackmer Pump Co., Grand Rapids 9, Mich., and mention this news item.



Railroad ballast for the Northern Pacific near Billings, Mont., is stockpiled by Pioneer belt conveyors. Grant Smith Co., contractor, installed the system to maintain continuous operation despite a shortage of cars.

Kaiser Appointments

The creation within its sales organization of two new posts has been announced by the Iron & Steel Division of the Kaiser Co., Inc., Oakland, Calif.

C. F. Borden has been named District Sales Manager for northern California, and Richard L. Erlin, Manager of Sales Service. Both will operate from the Oakland headquarters in the Latham Square Bldg.

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Milwaukee, Wis.

The Knickerbocker Co.
Jackson, Mich.

Safety in Welding Is a Personal Factor

"When you work with an oxy-acetylene blowpipe, you are playing with fire," *Oxy-Acetylene Tips* warns in a recent issue, "and you must therefore be familiar with the rules for fire prevention and follow them at all times." Though not a hazardous tool in itself, the welding torch, because it requires the use of flame, can be extremely dangerous if improperly used, the magazine points out.

At the present time many of the operators using oxy-acetylene blowpipes have been recently trained, and as yet are not fully acquainted with the dangers that may result from careless usage. This puts a double load on the shoulders of more experienced welders if fire losses are to be kept down. The trained man must observe all the fire-prevention rules himself, and at the same time must see to it that his less experienced fellow workers learn and observe them.

Before one begins cutting or welding in a new location, it is wise to check with the nearest person in authority, informing him of the work planned, so that he may point out fire hazards that may have been overlooked. Whenever possible, material to be worked on should be moved to a location where the possibility of fire is at a minimum. When this cannot be done easily, the work area should be cleared of all material and rubbish. In hazardous locations, an attendant, armed with a fire extinguisher, water, or sand, should be on duty all through the operation and for some time after to watch for sparks.

In areas where flammable materials cannot be moved, guards of sheet metal, asbestos paper, fire-resisting curtains, or similar material should be used to keep sparks confined. Cracks and holes through which sparks and slag might pass and cause fire should be sealed off before commencing work. When the metal being worked extends over the end of the bench, a pan of sand or water should be placed under the flame to

catch sparks and slag. In such work, a piece of sheet metal can also be used to provide a guard for the operator's legs. Keeping the recommended pressure in the cutting blowpipe is necessary, as much for safety as for economy. When working at a height of 7 feet, cutting sparks will travel 11 feet horizontally, if the correct cutting-oxygen pressure of 35 pounds is maintained, and then about 5½ feet further on the bounce. When using 70-pound pressure, however, the sparks will strike 14 feet away, and bounce 12 feet further, or a total distance of 26 feet; when 100-pound pressure is used, the sparks hit the ground at 16 feet and bounce 18 feet still further.

Detailed instructions on fire prevention while welding and cutting are available in a booklet, "Preventing

"Welding and Cutting Fires," which can be secured without charge from The Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

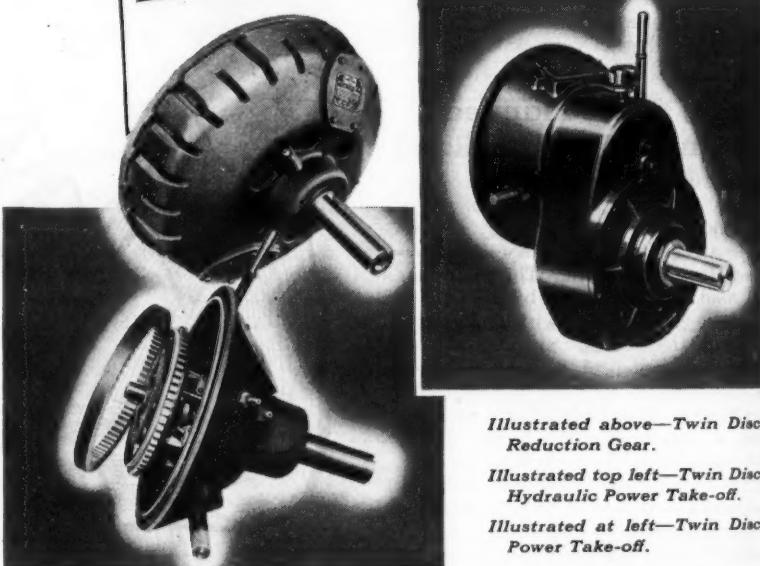
Brown-Bevis Expansion

Plans for the location of several new offices in the Southwest have been announced by the Brown-Bevis Equipment Co., equipment distributor of Los Angeles, Calif., with the addition of M. J. "Jim" Crossett to its executive staff. Mr. Crossett, serving as Assistant to the President, will supervise branch-office operations.

Until recently Mr. Crossett was General Superintendent of equipment for a joint project comprising Winston-Haglin, Missouri Valley, Sollitt for Naval Ordnance at Camden, Ark.

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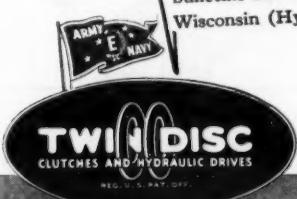
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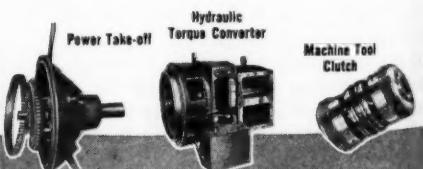
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Slab Jacking Methods Using Mud or Asphalt

Selection of Soil, and Care Of Mud-Jack When Used to Raise Slabs; Asphalt Is Pumped From Distributor

A STUDY resulting in a detailed report on the selection of soil for use in the Mud-Jack for raising concrete slabs, the care of the machine, and costs, and a second report on the experimental use of asphalt direct from a distributor for the same purpose have recently been released by the Virginia Department of Highways. The details may prove helpful to our readers for further study.

The Mud-Jack

The report on the work with a Mud-Jack and a soil-and-cement slurry was prepared by J. M. Hagan, District Engineer at Suffolk, Va., and starts out with a careful study of the machine used, a No. 50 Mud-Jack, because a knowledge of the machine itself is essential to its proper care and to the selection of satisfactory soils for the jacking medium.

The mixer in the Mud-Jack is of the continuous pugmill type. The blades are set at a slight angle to move the material forward and to mix it at the same time, cutting up any small clods or lumps in the soil. The mixer shaft is mounted on ball bearings which are protected by stuffing boxes and leather grease seals. Outside of each stuffing box, and between it and the bearings, is a large drain to take care of any material that may leak through. This drain must be kept open at all times when the machine is in operation. The grease seals and fittings are so placed that grease can be forced through the bearings and out through this drain. A good grade of pressure-gun grease, which will offer some resistance to water, should be used twice a day in both the stuffing boxes and the bearings.

The mud pistons are provided with a special rubber packing which can be adjusted for wear by removing the bottom plate from the pistons and placing a thin metal washer next to the rubber, causing it to expand when the plate is replaced and drawn down. If the cylinders are worn larger in the middle than at the end, the rubber packing should not be tightened until the cylinder is in place. Cap screws and bolts are so arranged that this can be done with a special long wrench. Care must be taken that the rubber does not fit the cylinder too tight. It should be no tighter than can be moved by the hand or a light bar. A Mud-Jack should never be run while the cylinders are dry as the rubber packing will stick to the cylinder walls, causing serious damage to the packing.

The hose used when pumping the mud is usually about 25 feet long, 2½ inches in diameter, and is reinforced with steel wire. A longer section than this is not advisable because of the extra pressure required to force the mud through the additional length. Care should be taken to avoid pumping mud through the hose when it is kinked. On the end of the hose is fitted a nozzle to which is attached a piece of 2-inch 4-ply wrapped water hose. This expands as the pressure is applied and holds the nozzle in the hole. A braid-weave water hose should not be used as this will not expand and the nozzle may be forced out of the hole.

There are several precautions that should be observed in handling the Mud-Jack. It should be thoroughly cleaned of all mud at the end of each day's work, and in hot weather it should not be allowed to stand during the noon hour as material is very apt to set up

in the machine. The mixer and pump are driven by a four-cylinder motor through a rubber belt. The belt will slip and provide a safety release in case the mixer and pump become jammed; therefore, the belt should never have dressing applied to it. The motor should receive the same attention as any truck motor.

Before the work of raising a slab is started, the mud in the machine should be brought to the proper consistency by placing the nozzle in the hopper and allowing the mud to circulate, at the same time regulating the proportions of water, soil, and cement until the proper consistency is obtained. The water used in the mud slurry should be clear as in any concrete work, and it should be free from grit. At no time should more

material be prepared than is required to keep the pump supplied. Since there are many moving parts in this machine and as rubber is used in the pumps and hose it is essential that no abrasive material be used to make up the slurry.

Raising Rigid Pavement

The next important factor that has a very direct bearing on the selection of material to be used is the method of raising the slab. An uneven grade settlement or subgrade failure is responsible for most slab failures. In Tidewater Virginia, where the Mud-Jack was used, most of the slab settlements were due to settlements in the grade where the highway fill was built over a slough. These settled sections varied from 10 to 1,000 feet in length and the depressions from ½ to 8 inches. In other sections of the state, the depressions were a result of isolated soft spots in the subgrade and pumping joints which caused voids to form beneath the slab. These voids varied from a cubic foot to several cubic yards.



To raise pavement slabs by the Mud-Jack method in Virginia, 2½-inch holes are drilled in the slab, about 5 to 6 feet apart.

The first operation in raising a slab is to drill 2½-inch holes through the pavement and from 4 to 6 inches below it. Where there are two 11 to 12-foot lanes, each lane is raised separately.

(Continued on next page)

Christmas 1945... It's going to be different this year. For the first time since 1940 the Christmas star will shine once more over a world at peace. With the war ending in such a glorious Victory, and our fighting men coming home... we look forward to the future with confidence—a future full of "Peace on Earth, Good Will Toward Men." The folks here at Galion—and that goes for our many Distributors—feel that a great measure of our happiness can be expressed to our many friends in the spirit of

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Slab Jacking Methods Using Mud or Asphalt

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The holes are drilled about 3 feet from the edge of the pavement and from 5 to 6 feet apart, and should be staggered. Where there is one slab 22 to 24 feet in width, the holes are started 3 feet from the edge and 5 to 6 feet apart across the entire pavement.

The material is forced through these holes in the slabs, and is of a consistency which will cause sufficient pressure to be exerted on the lower side of the slab before the slurry has traveled beyond the area which is to be raised.

It is necessary first to fill all the voids before the slab can be raised, and to do this a thin mud should be used so that it will flow evenly under the entire slab or the area affected. If a stiff mud is used at the beginning, it will not flow and will jack the slab unevenly and exert too great a pressure on a small section, causing the slab to crack. After all the voids underneath the slab are filled with a thin mud slurry, and this can be determined as soon as it is seen that the slab is beginning to rise, then the slurry can safely be thickened to the consistency of a fairly stiff mud. After the slab is raised to the desired grade, it is advisable to use a thin mud so that all the voids caused by traffic passing over the slab while the work is going on may be filled. This is especially advisable where the work takes more than one day.

In raising the settled section the lowest or most uneven portions are smoothed out first. Only a small amount of mud slurry is pumped into each hole at a time, moving about over the work in such a manner that no great strain is set up at any one place. Sometimes wooden plugs are used to stop the holes to keep the mud from flowing up on the pavement, but in most cases this can be prevented by having someone place his foot over the holes.

In some cases the shoulder has to be rebuilt to keep the material from coming out at the side, but if the shoulder is well stabilized the internal resistance created will hold the mud underneath the slab. A lean mud slurry will not have enough internal resistance and will break through the shoulder. In this case the mud slurry should be stiffened and in most cases this will stop the flow through the shoulder. This is one of the reasons for thickening the mud slurry as soon as all the voids under the pavement are filled.

If the slab has been raised several inches it is sometimes necessary to let the mud slurry set up before smaller uneven places can be taken out. On an average, it has been the experience in Virginia that from 40 to 50 per cent of the material pumped through the hole is used for filling the voids, and the balance of the material is for raising the slab. This varies according to the

length of the slab to be raised and the depth of the depression, but in raising a slab 4 to 5 inches it generally takes about 50 per cent of the material to fill the voids underneath the slab before the slab is raised.

Material for Mud Slurry

There seems to be some question about the material most suitable for the mud slurry. Generally any loose top-soil or silty loam that can be mixed into a thin mud may be used. This material may contain a small amount of sand with no ill effect, but if the sand content is high, a harsh mixture will result. Virginia has found that the material should be passed through a $\frac{1}{2}$ -inch screen to remove lumps or any vegetable matter. This makes the mixture easier to pump and takes out all material which may clog the machine. If the material contains stone or gravel larger than $\frac{3}{8}$ inch, the narrow opening between the slab and the supporting grade is apt to be clogged, causing the formation of voids. It has been found

that a silty loam, of which there are several pits in the Tidewater section of Virginia, is the most desirable. An analysis of the material used follows:

Mechanical Analysis		
Passing No. 10	100 per cent	
Passing No. 40	98 per cent	
Passing No. 100	75 per cent	
Passing No. 200	50 per cent	

Hydrometer Analysis		
Coarse sand, 2.0 to 0.25 mm.	1 to 2 per cent	
Fine sand, 0.25 to 0.05 mm.	25 to 30 per cent	
Silt, 0.05 to 0.005 mm.	50 to 70 per cent	
Clay, 0.005 to 0.001 mm.	5 to 10 per cent	

Physical Characteristics of Material Passing No. 40 Sieve

Field moisture equivalent	20 per cent
Liquid limit	19 per cent
Plastic index	N. P.
Shrinkage limit	16 per cent

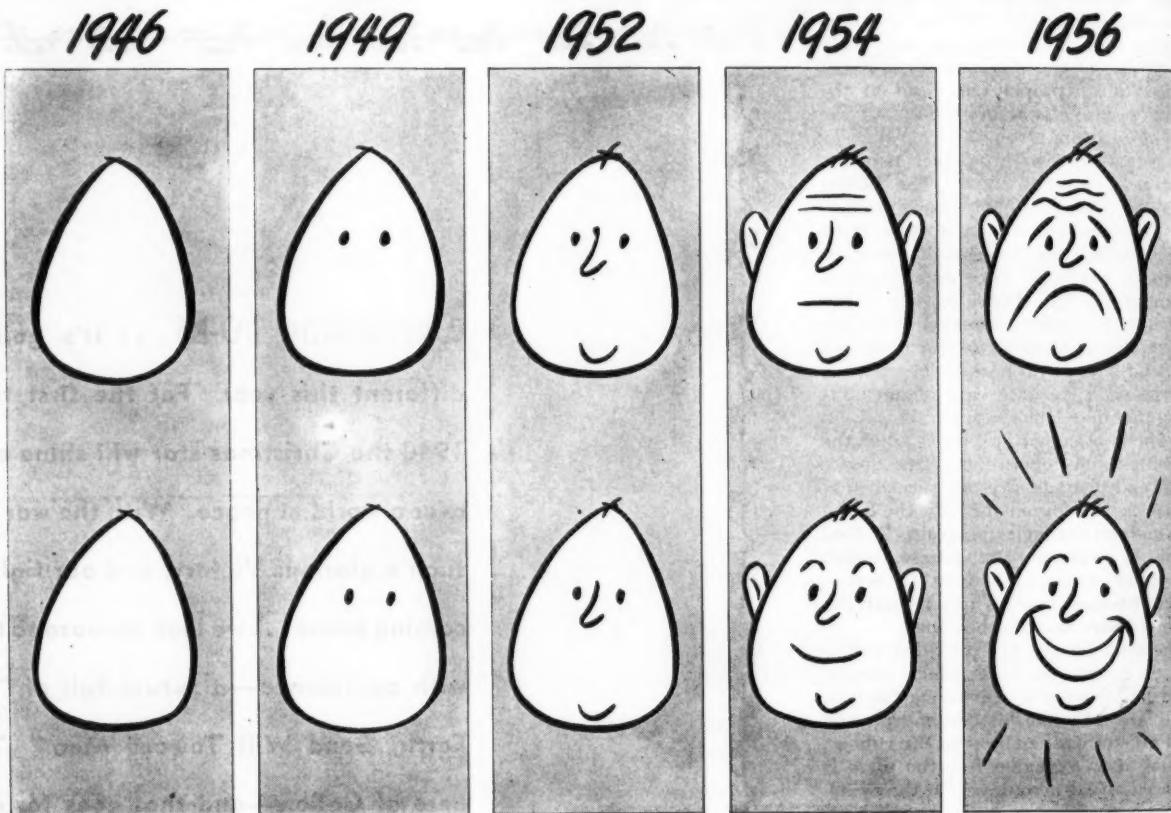
Material with 65 per cent passing the 200-mesh screen has been used with good results. The Mud-Jack is what the name implies, a mud pump rather than a mortar pump, and Virginia's experience is that a fine material up to certain limits is better than a coarse material, and a smooth mud works much better than a harsh mud.

To soil of the above approximate analysis are added from 3 to 4 bags of

cement per cubic yard of material, and from 90 to 120 gallons of water, depending upon whether a lean mud or a stiff mud is to be used. The weight of this mix varies from 3,300 pounds to 3,500 pounds per cubic yard, depending upon the amount of water used.

Some plaster of Paris has been used in Virginia where a quick set was required so that the work could be finished in one day. This is desirable where traffic is very heavy and has to be carried over the work, but for ordinary jobs where the traffic is not very heavy, or where an especially quick set is not desired, plaster of Paris is not recommended. Regular cement is more desirable than quick-setting or high-early-strength cement, except on very small sections that can be finished in less than a day. If high-early-strength cement is used and the work cannot be finished in one day, the holes have to be re-drilled. It has been found that the regular cement sets up sufficiently to hold the slab and at the same time al-

(Continued on next page)



Two ways your face can grow in the next few years

USUALLY, our faces show what's happening to us. For instance, suppose financial matters are constantly on your mind.

Suppose you know that there's practically no cash reserve between you and trouble.

It would be surprising if your face didn't show it.

But suppose that, on the contrary, you've managed to get yourself on a pretty sound financial basis.

Suppose that you're putting aside part of everything

you earn . . . that those dollars you save are busy earning extra dollars for you . . . that you have a nest egg and an emergency fund.

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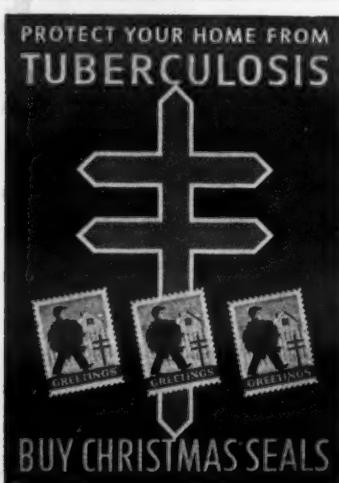
If you are buying, regularly, and holding as many U. S. Savings Bonds as you can, you needn't worry.

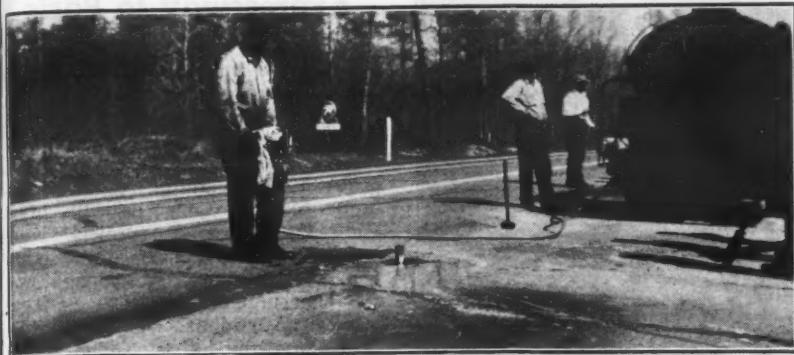
Your face will be among the ones that wear a smile.

Buy all the Bonds you can...keep all the Bonds you buy

CONTRACTORS AND ENGINEERS MONTHLY

This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council





Virginia has experimented successfully with asphalt for raising pavements. An average of 13.2 gallons of asphalt was used per hole, at a cost of about \$2.31.

Slab Jacking Methods Using Mud or Asphalt

(Continued from preceding page)

lows the work to continue the next day. The use of bituminous material in the mud slurry has been abandoned. At one time approximately 10 per cent of bituminous material was used but no beneficial results were observed and it is felt that the same results can be secured by carefully selecting the silty sand.

Costs, and Equipment Needed

The cost of the work varies greatly on account of the local conditions. An average cost of drilling the holes is from 20 to 25 cents each and the cost of the mud slurry pumped into the holes should be from \$15.00 to \$20.00 per cubic yard. The cost is generally about one-fourth the cost of removing and replacing the pavement. This, of course, depends on the amount of work to be done and the amount the slab has to be raised. The limit for economically raising a slab is from 8 to 10 inches at one time. With a depression of this magnitude, the cost is about equal to the cost of removing and replacing the pavement, but it has the advantage of not interfering with traffic, which would be necessary if the slab were replaced. Also, if there is a chance of future settlement and the slab may have to be raised at a later date, the cost of drilling the holes is paid for in the first operation. There are some sections across marshes in Tidewater Virginia where the slab has been raised to grade four or five times, amounting in all to from 12 inches to over 2 feet.

The equipment and labor needed for the operation is as follows:

- 1 Truck with water tank
- 2 Dump trucks
- 1 No. 50 Mud-Jack
- 1 120-cfm compressor
- 2 Drills with 2½-inch steel bits
- 1 Foreman
- 1 Operator
- 8 Laborers

The Service of the Mud-Jack

Mr. Hagan feels that the Mud-Jack has a definite place in the maintenance of rigid-slab pavements, especially where marshy conditions are encountered and it is not economical to stabilize the fill to 100 per cent of compaction at the time the pavement is laid. Virginia has found Mud-Jacking to be the most economical method of handling rigid-slab pavement failures resulting from settlements of subgrade or fills.

material on top of the slab, this does not correct the fundamental cause of the failure, and it is only by placing stable material underneath the slab that it can be given the bearing needed to prevent future failures.

Jacking Operations With Asphalt

As an experiment, the Richmond District in Virginia raised settled concrete slabs by the use of asphalt under the direction of P. W. Snead, District Engineer, and H. C. Beattie, Soils Engineer of the Department. An asphalt distributor was first equipped for the work and 6,000 gallons of Ohio specification F-1 asphalt was ordered. The experimental jacking operations were done on U. S. 1 near the Richmond city limits, north of Ashland.

Holes for the insertion of the asphalt nozzles were drilled in the slab 18 to 24 inches from the crack or joint and midway between the center joint and the edge of the pavement. The location of the hole was changed to suit varying conditions, and a little experience was

helpful in the selection of the best location. For instance, for subsealing only, the hole is now drilled 12 inches from the joints or cracks and 12 inches from the center joints.

After the holes were drilled, the mud and water beneath the slabs were blown out by forcing compressed air through one hole and under the slab. The asphalt having been properly heated, the pressure nozzle was then attached to the patching hose of the distributor and driven snug into the hole. A small amount of water was sprinkled around the hole so that any spilled asphalt might be easily removed, and the asphalt pumping was started.

As the slab rose, the asphalt broke out occasionally at a crack or joint along the pavement edge before the slab had been raised sufficiently. When this occurred the pumping was stopped and the asphalt at the leak chilled with water. It was possible to resume pumping in less than half a minute. If the leakage continued, however, a piece of

(Concluded on next page)



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Templeton, Kenly & Co., Chicago 44, Ill.



"I'll admit it's the hard way to do it but he never misses the slightest bump in the road!"

Slab Jacking Methods Using Mud or Asphalt

(Continued from preceding page)

clay or stiff mud was pressed down on the leak and held by standing on it. This was usually successful in confining the leak. When the desired rise had been completed, the asphalt nozzle was removed and a turned soft-wood plug was immediately driven into the hole flush with the pavement to prevent asphalt under pressure from being forced out of the hole. The spillage was then scraped off the pavement.

H. C. Beattie, Soils Engineer, reported that when this pumping was first started two holes were drilled, using a 1½-inch drill with the holes 3 feet from each edge of the pavement. However, it was found that one hole properly placed was sufficient. This hole was drilled 18 inches back of the joint and slightly to the right or left of the center line of the slab, depending on which way the slab had settled most. In most cases the joint was easily brought up evenly to a flush position except where the joints had dowels. In that case both slabs would rise together. In one case, the inside lane had settled below the outside lane. One hole was drilled in each end of the slab and the pressure was applied, bringing the entire slab up to a normal position. In this case the joint was longitudinal. At another point the pavement had settled 2½ inches on the outside edge so a hole was drilled 20 inches back and 2½ feet from the edge of the pavement. This slab came up very rapidly and was within an inch of being level when the asphalt blew through the shoulder.

In his report, Mr. Beattie states that in practically every case the joints were raised evenly, except where late-model dowels had been used. Where the old-type straight ½-inch dowel rods had been used they appeared to yield and the pavement came up properly. After the first day or two, there was much less asphalt blown through the shoulders and finally none at all. It was noted that the height the slabs were raised was variable, from ¼ to 1 inch, except in two or three cases where the height was as much as 1¼ inches.

It was found that the best temperature for the asphalt was between 380 and 400 degrees F. It was also found that the asphalt had to be heated again after 200 to 250 gallons had been used, due to the fact that at this point the asphalt began to get below the heating flues of the distributor and as soon as the asphalt was below that point the heating torches could not be started again because of the exposed flues. When the reheating was done before the asphalt was delivered to the distributor, it was found that the asphalt in the insulated distributor would hold its heat long enough to finish out the load.

The sections of pavement raised were on 11-foot lanes and 4-foot widenings on both the inside and outside north-bound lanes. The holes were plugged

with sawdust and finished off with 1½-inch plant-mix. Since the experiment the joints have been checked and seem to have remained in the same position as they were left when the work was completed. The roughness experienced when riding over the joints was caused by the joint filler coming to the top and hardening on the pavement at each joint. When this filler was cut away and the joint made flush, riding conditions improved immediately.

A total of 303 holes were drilled in the experiments with asphalt and an average of 13.2 gallons was pumped into each hole, making the cost approximately \$2.31 per hole which included labor, equipment, and material.

The report by Mr. Beattie concludes with the statement, "Under low joints where dowels were not used, the results obtained were very satisfactory. However, where dowels are used, more experimentation is necessary before it appears to be practical to attempt to raise the joints."



French Press & Information Service Photo
An aerial view of the new express highway from Saint Cloud to Saint Germain, part of an extensive project to relieve traffic congestion in the vicinity of Paris.

Expressway to Paris

An expressway to provide better connection between Paris, Brittany, and Normandy is nearing completion, French sources report. Part of a general highway plan laid out in 1935, when French engineers tackled the problem of supplanting certain picturesque but narrow roads with broad modern highways, the project should be completed by next spring if industrial shortages do not interfere with concrete supplies.

So as to minimize traffic congestion near Paris, the old St. Cloud bridge, dating to 1566, has been made over. A 60-foot-wide vaulted tunnel was cut through St. Cloud Hill to permit passage of a large volume of traffic without marring the beauty of its famous park. At Rocquencourt, near Versailles, a cloverleaf intersection of six one-way lanes has been built. The concrete highway has six lanes, divided by a median strip.

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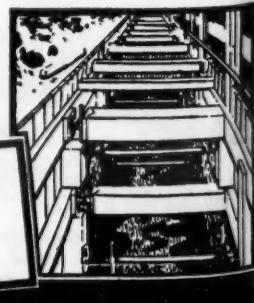
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Welding Electrodes Developed by Inco

Machinable welds in cast iron are now possible with a new welding electrode produced by the Development & Research Division of the International Nickel Co. The electrode, Ni-Rod, is among a group of new products offered by this firm. Another new electrode is No. 123, of 80-20 nickel chrome, for welding the Inconel side of Inconel clad steel.

Besides these, six other electrodes are being produced for arc welding by the Bayonne plant, while gas welding rod and uncoated wire for submerged melt welding are produced at the Huntington works. The Bayonne types are designed for Monel, Inconel, nickel, L nickel, K Monel, 70-30 cupro-nickel, and the various clad steels. They include the 132 ac-dc rod for use with Inconel. Fluxes for gas welding and brazing these metals are also produced at Bayonne, which has a maximum

capacity of over 1,000 pounds of electrodes an hour.

Further information on these electrodes may be obtained by writing the Nickel Information Service of the International Nickel Co., 67 Wall St., New York 7, N. Y., and mentioning this notice.

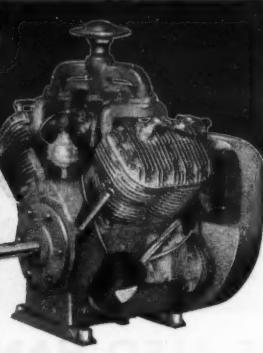
Two New Appointments By Chemical Companies

Harry W. Gleichert, associated with the Columbia Chemical Division of the Pittsburgh Plate Glass Co. since 1920, has been made Director of Sales for the Division. He will be located at the executive offices in Pittsburgh, Pa.

John C. Leppart, formerly with the Columbia Chemical Division, has been appointed Assistant to the Operating Vice President of the Southern Alkali Corp., Corpus Christi, Texas, which is owned jointly by Pittsburgh Plate Glass Co. and American Cyanamid & Chemical Corp.

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On U.S. 11 relocation between Tuscaloosa and Cedar Cove, Ala., J. E. Milam Construction Co. is using 4 Tournapulls borrowed from their half-million yard 11-mile grading job, to load, haul and spread 50,000 yards of sub-base material.

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the cost of a truck-haul set-up for similar material.

5 hours down time in 5 tough months — These machines have had only 5 hours of downtime in 5 months of tough service. This includes 60 days on the grading section of this job where these 4 Tournapulls moved 115,000 yards of dirt and 20,000 yards of rock, 15,000 yards of which was blasted rock.

Cut costs in half on slag spreading — On a previous job at the Anniston, Alabama Ordnance Depot, these Tournapulls handled 57,000 yards of grading and fine grading . . . also loaded, hauled and spread 30,000 yards of slag, beating truck costs for this work by 50%.

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